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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Thakur et al.

§
§ Group Art Unit: 2815
§
§ Examiner: P. Brock II
§
§ Atty. Docket: 94-0302.02
§
§
§
§
§

Serial No.: 09/654,093

Filed: August 31, 2000

For: A METHOD TO AVOID THRESHOLD
VOLTAGE SHIFT IN THICKER DIELECTRIC FILMS

TRANSMITTAL OF APPEAL BRIEF AND FEE AUTHORIZATION

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Commissioner for Patents
Washington, D.C. 20231

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7/9/02 Charles Brantley
Date Signature

Dear Sir:

Enclosed herewith is Applicants' Appeal Brief, submitted in triplicate. The Commissioner is authorized to charge the appropriate fee under 37 C.F.R. §1.17(c) of \$320.00, as well as any other required fee, to Micron Technology, Inc. Deposit Account No. 13-3092, Order No. 94-0302.02. This transmittal is being submitted in duplicate.

Respectfully submitted,

Charles Brantley

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AMOUNT OF PAYMENT (\$) 320

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Application Number	09/654,093
Filing Date	August 31, 2000
First Named Inventor	Thakur et al.
Examiner Name	P. Brock II
Group / Art Unit	2815
Attorney Docket No.	94-0302.02

METHOD OF PAYMENT (check one)

- 1.
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- The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

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13-3092 (Order No. 94-0302.02)

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- ☒
- Charge Any Additional Fee Required
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- Under 37 CFR 1.16 and 1.17
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- Applicant claims small entity status.
-
- See 37 CFR 1.27

- 2.
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FEE CALCULATION

1. BASIC FILING FEE

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid
101	740	201	370	Utility filing fee	
106	330	206	165	Design filing fee	
107	510	207	255	Plant filing fee	
108	740	208	370	Reissue filing fee	
114	160	214	80	Provisional filing fee	

SUBTOTAL (1)

(\$) 0

2. EXTRA CLAIM FEES

Total Claims	Extra Claims	Fee from below	Fee Paid
13	-20 **	0	0
Independent Claims	4	-4 **	0
Multiple Dependent			0

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description
103	18	203	9	Claims in excess of 20
102	84	202	42	Independent claims in excess of 3
104	280	204	140	Multiple dependent claim, if not paid
109	84	209	42	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2)

(\$) 0

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Fee Code	Entity Fee (\$)	Small Fee Code	Entity Fee (\$)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	920	217	460	Extension for reply within third month	
118	1,440	218	720	Extension for reply within fourth month	
128	1,960	228	980	Extension for reply within fifth month	
119	320	219	160	Notice of Appeal	
120	320	220	160	Filing a brief in support of an appeal	320
121	280	221	140	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,280	241	640	Petition to revive - unintentional	
142	1,280	242	640	Utility issue fee (or reissue)	
143	460	243	230	Design issue fee	
144	620	244	310	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Processing fee under 37 CFR 1.17 (q)	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	740	246	370	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	740	249	370	For each additional invention to be examined (37 CFR § 1.129(b))	
179	740	279	370	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) _____

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SUBTOTAL (3) 320

SUBMITTED BY**Complete (if applicable)**

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Appendix 2: Amendment and Response to the Office Action dated 9/4/01

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Appendix 4: *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983).

Appendix 5: *In re McLaughlin*, 443 F.2d 1392, 170 U.S.P.Q. 209 (C.C.P.A. 1971).

Appendix 6: *In re Young*, 927 F.2d 588, 18 U.S.P.Q.2d 1089 (Fed. Cir. 1991).

Appendix 7: *In re Zurko*, 258 F.3d 1379, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001).

APPLICANTS' BRIEF ON APPEAL

I. REAL PARTY IN INTEREST

The Applicants, Randhir Thakur, Ravi Iyer, and Howard Rhodes, have assigned their interest in this application to Micron Technology, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to the Applicants or the assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 1-64 have been presented during prosecution of the application under appeal.

Claims 1-51 have been canceled.

Claims 52-64 are pending.

Claims 52-64 are rejected.

Claims 52-64 are appealed.

IV. STATUS OF THE AMENDMENTS

Applicants filed no amendments subsequent to final rejection.

V. SUMMARY OF THE INVENTION

The current invention addresses methods to avoid threshold voltage shift in a dielectric. One exemplary embodiment is directed to a method of processing a semiconductor device. The method comprising: depositing a dielectric layer (FIG. 3, element 20) over a semiconductor substrate (FIG. 3, element 18; *see also* Specification at p. 8, ln. 23-p. 9, ln. 1), the substrate

comprising a plurality of electrically conductive regions (FIG. 3, elements 12) and an electrically insulative region therebetween (FIG. 3, element 14; see also Specification at p. 8, ln. 30-31); allowing electrically chargeable particles (FIG. 3, elements 24) to occur in the dielectric layer (Specification at p. 7, ln. 30 – p. 8, ln. 1); allowing some diffusion of the electrically chargeable particles (*id.* at p. 9, ln. 12-13); and preventing at least some of the electrically chargeable particles from reaching the substrate (*id.* at ln. 19-21). In a more specific embodiment of this type, the act of depositing a dielectric layer comprises using an organic precursor (*id.* at p. 7, ln. 16-18; p. 8, ln. 14-15); the act of allowing electrically chargeable particles to occur comprises allowing an organic component of the organic precursor to deposit in the dielectric layer (*id.* at p. 7, ln. 23-30); and the act of preventing comprises layering a barrier (FIG. 3, element 30) over the substrate using a non-organic precursor prior to the act of depositing a dielectric layer (*id.* at p. 8, ln. 28-31; p. 9, ln. 24-33).

Another exemplary embodiment within the scope of the current invention is directed to a method of processing a substrate comprising two active areas and an intervening insulating region. The method comprises: depositing an oxide charge barrier over the substrate (Specification at p. 8, ln. 28-31; FIG. 3, element 30); depositing a generally insulative material over the oxide charge barrier (*id.* at p. 5, ln. 24-25 (listing as non-limiting examples BPSG, BSG, PSG, and silicon dioxide); p. 8, ln. 28-31; FIG. 3, element 20), wherein the generally insulative material is less insulative than the barrier (*compare id.* at p. 5, ln. 24-25; p. 7, ln. 16-p. 8, ln. 4 (discussing exemplary dielectric materials with oxide charges therein) *with* p. 9, ln. 24-p. 10, ln. 32 (discussing exemplary barrier materials and methods of formation)); and providing a generally conductive element (FIG. 3, element 26) over the generally insulative material (FIG. 3; element 20; *see also* Specification at p. 5, ln. 25-28), wherein the element is generally laterally coextensive with the intervening insulating region (*id.* at p. 5, ln. 25-30; *compare* FIG. 3, element 26 *with* FIG. 3; element 14).

Still another exemplary embodiment within the scope of the current invention is directed to a method of at least partially forming a circuit device, comprising: providing a semiconductor substrate (Specification at p. 5, ln. 10; FIG. 3, element 18); layering a carbon-free barrier on the substrate (*id.* at p. 9, ln. 24-33; FIG. 3, element 30); and layering a carbon-containing dielectric on the barrier (*id.* at p. 7, ln. 1-15; p. 8, ln. 14-22; FIG. 3, element 20).

VI. ISSUES

There are six issues for determination on appeal:

1) whether one of ordinary skill in the art is reasonably apprised under 35 U.S.C. §112 of the scope of claim 60;

2) whether the Examiner has failed to meet the burden for rejection under 35 U.S.C. §103 based on a combination of Doan and Boland;

3) whether the Examiner has failed to meet the burden for rejection under 35 U.S.C. §103 based on a combination of Doan and Cunningham;

4) whether the Examiner has failed to meet the burden for rejection under 35 U.S.C. §103 based on a combination of Doan, Cunningham, and Ying;

5) whether the Examiner has failed to meet the burden for rejection under 35 U.S.C. §103 based on a combination of Doan and Ghezzi; and

6) whether the Examiner has failed to meet the burden for rejection under 35 U.S.C. §103 based on a combination of Doan, Ghezzi, and Van Der Scheer.

VII. GROUPING

Applicants define the following groups of claims for consideration upon this appeal. These groups correspond to the issues listed above.

Group I: claim 60;

Group II: claim 52;

Group III: claims 53-57;

Group IV: claims 58-59;

Group V: claims 60-61 and 63-64 (the claims do not necessarily fall together);

and

Group VI: claim 62.

VIII. ARGUMENT

The Examiner's Final Office Action is directed to rejections based on 35 U.S.C. §§ 112 and 103. Applicants note that the Examiner also quoted 35 U.S.C. §102 as if in preparation for rejecting certain claims under that basis. (Office Action dated 2/1/02 at p. 2, ¶#3.) However, the Examiner immediately thereafter quoted §103 and addressed the claim rejections under that basis. (*Id.* at p. 3.) Accordingly, Applicants understand that there are no §102 rejections currently being asserted against the claims. Applicants address the Examiner's §112 and §103 rejections separately below.

A. One of ordinary skill in the art is reasonably apprised under 35 U.S.C. §112 of the scope of claim 60.

Claim 60 refers to a “generally insulative material” and a “generally conductive element” that is “generally laterally coextensive” with an intervening insulating region. In the Final Office Action, the Examiner argued that the term “generally” lacks support in the Specification and that one of ordinary skill in the art would not be reasonably apprised of the scope of the invention given that term. As a result, the Examiner found the claim to be indefinite. The Examiner's text addressing this rejection appears to have been lifted verbatim from a previous Office Action. (*Compare* Office Action dated 2/1/02 at p. 2, ¶#2 *with* Office Action dated 9/4/01 at p. 2, ¶#2.)

Accordingly, Applicants have already presented counter arguments in the Amendment and Response to the Office Action dated 9/4/01. Applicants submit that those counter arguments still apply and refute the Examiner's rejection. In order to avoid unnecessary redundancy, Applicants will not repeat those counter arguments here, although a copy of the Amendment and Response is included in an appendix for the Board's convenience. In summary, Applicants pointed out support in the Specification for those terms and provided relevant dictionary definitions, which indicate the ability of one of ordinary skill in the art to ascertain the requisite degree indicated by the term “generally.” (Amendment and Response at p. 2-4.)

The Examiner subsequently admitted that the Specification provides examples of insulative, conductive, and laterally coextensive elements. (Office Action dated 2/1/02 at p. 8,

¶11.) Nevertheless, the Examiner announced a refusal to assume that the claim's limitations, which include the qualification "generally," are the same as the Specification's supporting text. (*Id.*)

Applicants agree that the claim's limitations are not the exact same as the Specification's examples and in fact expressed so by referring to those examples as "non-limiting." (Amendment and Response at p. 3.) However, Applicants contend that the Specification's myriad examples alert one of ordinary skill in the art that there is no one particular/bright-line/absolute threshold magnitude for conductivity, insulativity, or lateral extensivity. Applicants further contend that the dictionary definitions previously provided indicate that one of ordinary skill in the art would already be aware of that -- and would understand that there is inherent uncertainty in such qualities at some level of scrutiny -- even before reading the Specification. (Applicants also note that the Examiner failed to address those dictionary definitions.) Hence, one of ordinary skill in the art, being deemed by law to be aware of the dictionary definitions provided and therefore accepting of their inherent uncertainty, would understand what is claimed given that background knowledge and the non-limiting yet supporting examples in the Specification. Accordingly, Applicants request that the Board reverse the Examiner and allow claim 60.

B. The Examiner has failed to meet the burden for any of the rejections under 35 U.S.C. §103

The Examiner rejected different groups of the appealed claims as being obvious based on different combinations of references. Applicants address each combination of references separately below.

1. The Examiner has failed to meet the burden for rejection based on a combination of Doan and Boland.

In the Final Office Action, the Examiner rejected claim 52 as being obvious in light of Doan (U.S. Pat. No. 5,372,974) in combination with Boland (U.S. Pat. No. 5,084,407). This

attempted combination, which did not appear in the previous Office Action, raises several issues which Applicants address separately below.

a) The Examiner's citation to Doan does not support the Examiner's argument

The Examiner began the argument in support of a Doan/Boland rejection by citing Doan's figure 2 as illustrating a method of processing a semiconductor device. Applicants note, however, that Doan's figure 2 is actually a cross-sectional view of a buckling semiconductor substrate, which was known prior to Doan, characterized as undesirable by Doan, and hence taught away from by Doan. (Doan at col. 1, ln. 11-17 (touting the need to perform process steps on a uniform surface); ln. 41-54 (describing figure 2 and warning that figure 2's buckled substrate will substantially impact fabrication); col. 3, ln. 26-27 (further describing figure 2); FIG. 2 (indicating that the illustration depicts known art); col. 2, ln. 6-8 (indicating that one object of Doan's invention is to reduce the effects of buckling); Abstract (referring to Doan's method of reducing the effects of buckling); Title (announcing an approach to avoid buckling).) Boland's emphasis on planarization also teaches away from the method illustrated in Doan's figure 2 and cited by the Examiner. (Boland at title (announcing a method for planarizing); Abstract (referring to Boland's method for planarizing); col. 1, ln. 9-29 (indicating a need for greater planarity); ln. 50-64 (summarizing Boland's planarization method); col. 3, ln. 50- col. 4, ln. 34 (detailing Boland's planarization step).) Hence, both of the references relied upon by the Examiner teach away from the method cited by the Examiner. Thus, to the extent that the Examiner's rejection relies on the citation to Doan's figure 2, the rejection is untenable and warrants the Board's reversal of the Examiner and allowance of claim 52.

b) When viewed as a whole, Doan and Boland conflict to a degree that would discourage one of ordinary skill in the art from combining.

The Examiner proposed combining the teachings of Doan and Boland such that Doan's method would be practiced over Boland's planarized surface, which consists of dielectric islands (elements 12) and active areas (elements 22). (Office Action dated 2/1/02 at p. 3.) The Examiner

suggested that Boland's planarized surface provided the motivation for one of ordinary skill in the art to combine. (*Id.*) However, Applicants submit that, when Doan and Boland are viewed as a whole, they contain conflicts to the extent that would discourage one of ordinary skill in the art from combining.

Binding case precedent in fact requires that the references be considered as a whole:

[w]hen prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. There must be "something in the prior art *as a whole* to suggest the desirability, and thus the obviousness, of making the combination". . . . Not only must the claimed invention as a whole be evaluated, but so also must the references *as a whole*
....

(*Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 227 U.S.P.Q. 543, 551 (Fed. Cir. 1985) (citations omitted) (emphasis added). See also *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303, 308, 311 (Fed. Cir. 1983) (requiring that section 103 references be assessed in their entireties), *cert. denied*, 469 U.S. 851 (1984).) Even case precedent cited by the Examiner earlier in prosecution is consistent with this requirement. *In re McLaughlin* (443 F.2d 1392, 170 U.S.P.Q. 209 (C.C.P.A. 1971)) emphasizes that, in considering whether to combine references for an obviousness rejection, the Examiner must consider what the references "*taken as a whole* would suggest to one of ordinary skill in the art." (*McLaughlin*, 170 U.S.P.Q. at 212 (emphasis added). *Interconnect*, *Gore*, and *McLaughlin* are provided in appendices to this Appeal Brief.)

Further, when the prior art contains conflicting references, the ability of each reference to suggest solutions to one of ordinary skill in the art must be considered. (See *In re Young*, 927 F.2d 588, 18 U.S.P.Q.2d 1089, 1091 (Fed. Cir. 1991). This case is also provided in an appendix to this Appeal Brief.) Applicants assert that considering the references as a whole necessitates more than merely focusing on their points that may arguably support an obviousness rejection; rather, it further requires considering the conflicts between the references, as required by *Young*.

Applying such standards to the Examiner's references brings to light the fact that each reference achieves planarization in a distinct way that renders the method in the alternative reference unnecessary and even undesirable. Boland, for example, is content to planarize using

chemical-mechanical planarization (CMP). (Boland at Abstract; col. 3, ln. 50- col. 4, ln. 14; claims 1-8 (limiting the planarizing step to one using chemical-mechanical means); claim 9 (limiting the removing step to one using chemical-mechanical means).) It follows that one of ordinary skill in the art seeking to planarize layers subsequently provided over Boland's dielectric island/active area surface would turn once again to the CMP method touted by Boland. Hence, one of ordinary skill in the art, keeping Boland's teachings in mind, would view including Doan's barrier layer as adding unnecessary time, expense, and process complexity to forming a Boland-type device. Further, such an artisan would view Doan's thermal reflow methods as consuming an unnecessary portion of the thermal budget allotted to fabricating a device. (See Doan at col. 1, ln. 25 and col. 2, ln. 20 (highlighting the issue of thermal budget concerns).)

Conversely, Doan's focus is planarization by way of thermal reflow. (Doan at col. 2, ln. 13; col. 3, ln. 13; col. 4, ln. 47-49; claims 1-18, step (d).) Further, Doan seeks to isolate layers from stress that may deform the surface of those layers during planarization. (Doan at col. 3, ln. 60-col. 4, ln. 27.) However, the mechanical aspects of Boland's CMP may very well expose at least one of Doan's layers to stresses having a result similar to one that Doan seeks to avoid. Hence, one of ordinary skill in the art, keeping Doan's teachings in mind, would view including Boland's process in forming a Doan-type device as defeating the very goal of Doan.

Thus, when considered as a whole, Doan and Boland conflict on a level so fundamental that one of ordinary skill in the art would be discouraged from attempting this or any other combination of their teachings. Such a conclusion provides further support for the Board's reversal of the Examiner and allowance of claim 52.

c) The Examiner's rejection demonstrates an improper use of hindsight gained from the current application's teachings

Moreover, the Examiner's ability to ignore the fundamental conflicts between the references and instead focus solely on portions of Doan and Boland that purportedly support rejection indicate that the Examiner is relying on guidance from the current application. In using the current application in such a manner, the Examiner has violated another tenet of *McLaughlin*, which requires that the "judgment on obviousness . . . not include knowledge

gleaned only from applicant's disclosure." (*McLaughlin*, 170 U.S.P.Q. at 212.) As a result, the Board's reversal of the Examiner and allowance of the claims is still further supported.

2. The Examiner has failed to meet the burden for rejection based on a combination of Doan and Cunningham

The Examiner rejected claims 53-57 as obvious in light of Doan in combination with Cunningham (U.S. Patent 5,468,689). In contrast to a previous rejection citing this combination, the Examiner's discussion of Doan in the latest rejection relies more on what the Examiner believes to be inherent teachings of Doan. (*Compare* Office Action dated 2/1/02 at p. 4 *with* Office Action dated 9/4/01 at p. 4-5.) (*But see In re Zurko*, 258 F.3d 1379, 59 U.S.P.Q.2d 1693, 1697 (Fed. Cir. 2001) (requiring the PTO to point to some concrete evidence in the record, rather than relying on the PTO's own understanding and experience, in establishing what is inherent in a reference). A copy of *Zurko* is included in an appendix to this Appeal Brief.)

Nevertheless, the Examiner's application of Cunningham and discussion of the dependent claims appears to have been lifted verbatim from a previous Office Action. (*Compare* Office Action dated 2/1/02 at p. 4-5 *with* Office Action dated 9/4/01 at p. 4-5.) Accordingly, Applicants have already presented counter arguments in the Amendment and Response to the Office Action dated 9/4/01. Applicants submit that those counter arguments still apply and refute the Examiner's current rejection. Once again, Applicants refer the Board to the copy of the Amendment and Response that is included in an appendix in order to avoid unnecessary repetition of those counter arguments. In summary, Applicants cited binding case precedent – *Young* (addressed in part B(1)(b) above) – which requires the Examiner to consider the ability of one of ordinary skill in the art to combine references given conflicts between them. (Amendment and Response at p. 4-5.) Applicants then pointed out that Doan and Cunningham conflict to such an extent that one of ordinary skill in the art would be actively discouraged from combination. (*Id.* at 5. This argument is also detailed in a portion of part 3 below.)

The Examiner's response is to admit that "[t]he only teaching that the examiner has gleaned from Cunningham is a method of forming a nitride layer using a non-organic precursor." (Office Action dated 2/1/02 at p. 9.) The Examiner's admission indicates a failure to abide by binding case precedent (addressed in detail above in part B(1)(b)) that requires the Examiner to

consider a reference's teachings *as a whole*. (See *Interconnect*, 227 U.S.P.Q. at 551; *Gore*, 220 U.S.P.Q. at 308, 311; *McLaughlin*, 170 U.S.P.Q. at 212.)

Applicants once again assert that considering the references as a whole necessitates more than merely focusing on their points that may arguably support an obviousness rejection; rather, it further requires considering the conflicts between the references, as required by *Young*. The Examiner failed to address such conflicts in the last Office Action, even after being reminded by Applicants. (Amendment and Response at p. 5.) As a result, the Examiner's admitted conduct is legally improper under binding case precedent, thereby further supporting the Board's reversal of the Examiner and allowance of the claims.

Moreover, the Examiner's ability to focus solely on portions of Cunningham that purportedly support rejection indicate that the Examiner is relying on guidance from the current application. In using the current application in such a manner, the Examiner has violated another tenet of *McLaughlin*, which requires that the "judgment on obviousness . . . not include knowledge gleaned only from applicant's disclosure." (*McLaughlin*, 170 U.S.P.Q. at 212.) Thus, the Examiner's admitted conduct indicates legally impropriety under yet another standard set forth by the very case cited by the Examiner. As a result, the Board's reversal of the Examiner and allowance of claims 53-57 is further supported.

3. The Examiner has failed to meet the burden for rejection based on a combination of Doan, Cunningham, and Ying.

The Examiner rejected claims 58 and 59 as obvious in light of Doan and Cunningham in combination with Ying (U.S. Patent 5,384,288). With the exception of a few words in the first sentence of the latest rejection, the Examiner's text addressing this rejection appears to have been lifted verbatim from an earlier Office Action. (*Compare* Office Action dated 2/1/02 at p. 5-6 *with* Office Action dated 9/4/01 at p. 5-6.) Accordingly, Applicants have already presented counter arguments in the Amendment and Response to the Office Action dated 9/4/01. Applicants submit that those counter arguments still apply and refute the Examiner's rejection. Those counter arguments, however, refer to still other counter arguments presented in an even earlier Response. Thus, for the sake of clarity, Applicants consolidate the substance of the arguments below.

The problem with attempting to combine Doan, Cunningham, and Ying is that each reference conflicts with the other two to such an extent that one of ordinary skill in the art, considering the references as a whole, would be discouraged from combining their teachings. Considering Doan and Ying, for example, the references' teachings conflict on a very fundamental level. Specifically, while both teach methods concerning providing a planarized surface, their methods are completely contradictory. Doan proposes interposing between two layers a film with enough rigidity and structural integrity to prevent the stresses from one layer from affecting the other during a reflow process. (Doan at Abstract; col. 4, ln. 17-27; ln. 44-60.) To do otherwise would allow the layers' differences in coefficients of thermal expansion to cause a buckling effect. (*Id.* at col. 1, ln. 28-40.) Ying, to the contrary, teaches creating, exacerbating, and transmitting stress to layers in order to aid in planarization, the thought being that the stress will lower the temperature at which the layers will reflow. (Ying at col. 4, ln. 10-14; ln. 23-25; 48-50; 65-68.) Applicants contend that one of ordinary skill in the art would be discouraged from even attempting to combine the teachings of references that offer completely contradictory strategies for dealing with the same problem.

As for conflicts between Doan and Cunningham, it is noteworthy that Cunningham touts concern over material cracking during reflow. (Cunningham at col. 1, ln. 45-53.) As a result, Cunningham teaches providing a nitride barrier 14 over its "top" layer 13. (*Id.*; *see also* col. 3, ln. 21-38; FIG. 1.) Significantly, however, Cunningham does not provide its nitride barrier between layers that comprise its stack. (*Id.*) Thus, one of ordinary skill in the art is lead to believe that there is no need for such a barrier in that location and hence, no cracking issues there. On the other hand, Doan, which also expresses concern over material cracking during reflow, indicates that cracking between layers of the stack is a major problem. Specifically, Doan teaches providing a nitride barrier between each and every layer of its stack. (Doan at col. 4, ln 28- col. 5, ln. 9; FIGS. 6-7.) Thus, in light of Cunningham, Doan appears to one of ordinary skill in the art to require unnecessary redundancy in terms of barrier layers, thereby adding unnecessary time, money, and effort to the fabrication process. Conversely, in light of Doan, Cunningham appears to the artisan to leave its device susceptible to the very cracking problem Cunningham seeks to avoid. Given such fundamental conflicts, Applicants assert that the references lack the ability to suggest solutions to one of ordinary skill in the art and in fact discourage their combination.

Finally, Cunningham and Ying conflict as well. Significantly, the processes taught in both references require a barrier material such as a nitride. Cunningham requires that its nitride barrier 14 expose a portion of a silicon substrate 11 in order to grow GaAs thereon. (Cunningham at col. 3, ln. 21-38; FIG. 1.) Ying, on the other hand, requires that its nitride barrier 14 expose none of the substrate 10 in order to protect the substrate 10 from subsequent processing. (Ying at col. 3, ln. 18-28; FIGS. 1A-1C.) Thus, one of ordinary skill in the art attempting to combine the references would achieve a Cunningham-type device with a continuous nitride barrier that covers the substrate and hinders the desirable growth of GaAs. Alternatively, the artisan would achieve a Ying-type device having a nitride barrier that exposes the substrate, thereby allowing undesirable deterioration during subsequent processing. Either combination is unworkable and hence provides further discouragement in attempting a Doan/Cunningham/Ying combination.

The Examiner's response is to admit that "[t]he only teaching that the examiner has gleaned from Ying is a specific method of heating a carbon-containing dielectric." (Office Action dated 2/1/02 at p. 9.) As with the Examiner's admission in part 2 above, this latest statement expressly demonstrates the Examiner's failure to consider the references as a whole (deemed legally improper by *Interconnect*, *Gore*, and *McLaughlin*) and indicates an improper use of hindsight gleaned from the current application (deemed legally improper by *McLaughlin*).

Thus, the conflicts between Doan, Cunningham, and Ying; the Examiner's lapse in failing to consider those conflicts; and the Examiner's ability to focus on particular portions of Cunningham and Ying despite those conflicts favor the Board's reversal of the Examiner and allowance of claims 58-59.

4. The Examiner has failed to meet the burden for rejection based on a combination of Doan and Ghezzi

The Examiner rejected claims 60-61 and 63-64 as being obvious in light of Doan in combination with Ghezzi (U.S. Patent 5,132,239). The Final Office Action's text addressing this rejection appears to have been lifted verbatim from a previous Office Action (*compare* Office Action dated 2/1/02 at p. 6-7 *with* Office Action dated 9/4/01 at p. 6-7) which, in turn, is

substantially similar to an even earlier Office Action (*compare* Office Action dated 9/4/01 at p. 6-7 *with* Office Action dated 1/26/01 at p. 4-5). Accordingly, Applicants' previous arguments, which span several responses, still apply and refute the Examiner's rejection. Nevertheless, for the sake of clarity, Applicants consolidate and supplement the substance of the arguments below.

Applicants contend that the Examiner has misinterpreted Doan as well as Ghezzi, and that one of ordinary skill in the art would be actively discouraged from combining these references. Concerning the Examiner's misinterpretation of Doan, the Examiner assumed that Doan discloses depositing an insulative material that is less insulative than the underlying barrier. While Doan discloses one material selected from a list of conductive or insulative materials (Doan at col. 3, ln. 50-59) over a second material selected from a list of conductive, semiconductive, and insulative materials (*id.* at ln. 28-43), there is nothing in Doan specifying the relative insulative qualities of the two layers. Rather, Doan's focus in terms of material selection is that the material maintain its rigidity and structural integrity upon subsequent heating steps. (*Id.* at col. 4, ln. 17-27.)

Concerning the Examiner's misinterpretation of Ghezzi, the Examiner assumed that Ghezzi discloses a conductive element (citing Ghezzi's element 5 in FIG. 3) that is coextensive with an insulating region (citing Ghezzi's element 21 in FIG. 3). Ghezzi's insulation 21, however, extends only from one field oxide region 11 to another. Ghezzi's conductive element 5, on the other hand, not only extends over that area but also extends over multiple field oxide regions 11 as well as over coupling area 12. Hence, Ghezzi's conductive element 5 cannot be described as being coextensive with Ghezzi's insulation 21.

As for the purported motive to combine Doan with Ghezzi, the Examiner merely concluded that it would be obvious to use Doan's process to form Ghezzi's floating gate transistor. Unfortunately, such a conclusion does not provide a motive for making such a combination; and the Examiner's failure to articulate such a motive indicates that the *prima facie* burden for rejection has not been met. Moreover, Applicants contend that the burden cannot be met because there is no motivation to combine. The goal of Doan's invention is planarity; and the almost informal drawings of Ghezzi suggest that planarity is not an issue (*see* Ghezzi at FIGS. 2, 3, 4). In addition, the Examiner is unclear about what the Doan-modified Ghezzi transistor would look like (thereby further supporting the notion that *prima facie* burden for rejection has not been met), but presumably such a transistor would include Doan's film 40

somewhere between Ghezzi's silicon substrate 2 (the first material provided) and at least one of Ghezzi's conductive gates 1, 5 (the last material addressed and pictured in Ghezzi). Applicants contend that any material other than the gate oxide located between Ghezzi's silicon substrate and one of Ghezzi's conductive gates would interfere with the operation of the transistor. As a result, one of ordinary skill in the art is discouraged from making the Examiner's proposed combination.

Thus the Examiner's misinterpretation of the references, combined with the Examiner's failure to provide a motivation to combine those references and Applicants' articulated motives against combination indicate that the *prima facie* burden for rejecting claims 60, as well as dependent claims 61, 63, and 64, has not been met.

Moreover, concerning dependent claim 64, the Examiner further interpreted Doan as disclosing refraining from depositing a conductive material before depositing an insulative material. As mentioned above, Doan discloses so many options for its relevant layers that it allows for depositing a conductive material (such as tungsten, titanium, copper, or aluminum) before depositing an insulative material (such as tantalum oxide, silicon oxide, silicon nitride, or TEOS) and hence cannot be interpreted as disclosing refraining from such alternatives. (*See* Doan at col. 3, ln. 50 – col. 4, ln. 27.) Further, because the rejection of claim 64 suffers this failure in addition to the failures applying to the rejection of claims 60 and 61, Applicants contend that claim 64 does not necessarily fall with the other claims in its group.

5. The Examiner has failed to meet the burden for rejection based on a combination of Doan, Ghezzi, and Van Der Scheer

The Examiner rejected claim 62 as being obvious in light of Doan and Ghezzi in combination with Van Der Scheer (U.S. Patent 4,976,856). Despite minor changes in the wording of the latest rejection, it is essentially the same as that raised in two previous Office Actions. (*Compare* Office Action dated 2/1/02 at p. 8 *with* Office Action dated 9/4/01 at p. 7 *and* Office Action dated 1/26/01 at p. 6.) Accordingly, Applicants' still applicable counter arguments span across multiple Responses. Thus, for the sake of clarity, Applicants consolidate the substance of the arguments below.

As discussed above, the Doan-Ghezzi rejection suffers from (1) the Examiner's misinterpretation of the references; (2) a failure to articulate why one of ordinary skill in the art would be motivated to combine the references; and (3) indications that such an artisan would be discouraged from that combination. These problems carry through to the rejection of claim 62.

Moreover, such problems are exacerbated by the Examiner's attempt to add Van Der Scheer to the combination. In a manner similar to the rejection of claim 60, the Examiner merely concluded that it would be obvious to use Doan's process in order to carry out Van Der Scheer's process. Unfortunately, the Examiner did not provide a motive for such a combination. This may be due to the fact that there is no such motive and, further, there are motives to avoid combination. Doan's process is directed to providing a planar surface. Van Der Scheer, on the other hand, is in no way concerned about the planarity of its workpiece. Specifically, Van Der Scheer indicates that its substrate may have "any suitable shape," including a tubular shape, and in fact prefers a tubular substrate because it can withstand high pressure differences. (Van Der Scheer at col. 4, ln. 15-32.) Moreover, inserting a layer such as Doan's layer 40 into Van Der Scheer's membrane layers risks affecting the selectivity or non-porosity of Van Der Scheer's device.

Similar compatibility issues exist between Ghezzi and Van Der Scheer. Ghezzi's focus is providing different dopant concentrations in a semiconductor substrate so that the gate oxide will grow thereon to different thicknesses. There is no indication as to how Van Der Scheer's process for forming a non-porous selective membrane would affect or be affected by such a process. As a result, one of ordinary skill in the art would be wary of combination.

Thus, given the untenable rejection of claim 62's independent claim, the lack of an articulated motivation to include Van Der Scheer as part of an obviousness rejection, and the articulated motives to avoid including Van Der Scheer in such a rejection, the rejection of claim 62 is untenable.

Further, the Examiner's failure to address the conflicts between the references even after being notified by Applicants suggests that the Examiner has failed to consider the references as a whole, ignored those conflicts, and been able to focus on certain aspects of the references based on knowledge gleaned from the current application; thus, the Examiner's conduct fails to satisfy the standards set forth in *Interconnect*, *Gore*, *McLaughlin*, and *Young*, which warrants the Board's reversal of the Examiner.

C. The case precedent cited in the Examiner's response is either irrelevant or actually favors Applicants.

The Examiner raised several points at the end of the latest Office Action in response to Applicants' arguments. (Office Action dated 2/1/02 at p. 8-9.) Some of these points are clearly directed to arguments against particular rejections and have been rebutted above. Other points do not appear to be directed to one particular argument; Applicants addresses those points separately below.

1. The Examiner's case precedent concerning rejection based on hindsight favors Applicants.

The Examiner admitted to relying on hindsight for constructing at least one obviousness argument and cited *McLaughlin* as support for that conduct. Specifically, the Examiner indicated that *McLaughlin* allows for hindsight reasoning so long such reasoning takes into account "only knowledge which was within the level of ordinary skill at the time the claimed invention was made." (Office Action dated 2/1/02 at p. 8-9 (citing *McLaughlin*, 170 U.S.P.Q. at 212).) However, as addressed above, the obviousness rejections suffer from the Examiner's misinterpretations of the references and/or the Examiner's ignorance of conflicts between the combined references. Such conduct demonstrates the Examiner has failed to rely on "only knowledge which was within the level of ordinary skill at the time the claimed invention was made." Rather, the Examiner's ability to interpret the references in a manner not supported by their text and ability to disregard the legion of contradictory teachings between the references demonstrate that the Examiner has in fact made an obviousness judgment that includes knowledge gleaned from Applicants' disclosure. This is prohibited by the very case cited by the Examiner. (*McLaughlin*, 170 U.S.P.Q. at 212.) Thus, while the Examiner's statement of one of *McLaughlin*'s rules may be true, that statement has no bearing on the current facts given the Examiner's conduct, and another of *McLaughlin*'s rules highlight the legal impropriety of that conduct.

Still other portions of *McLaughlin* favor Applicants in that they demonstrate the legal impropriety of the Examiner's admitted conduct, wherein the Examiner gleaned only particular teachings from certain references. (See Office Action dated 2/1/02 at p. 9, ¶¶ 14, 15; see also Appeal Brief at parts VIII(B)(2)&(3).) *McLaughlin* emphasizes that, in considering whether to combine references for an obviousness rejection, the Examiner must consider what the references "taken as a whole would suggest to one of ordinary skill in the art." (*McLaughlin*, 170 U.S.P.Q. at 212 (emphasis added).) Applicants reiterate that considering the references as a whole necessitates more than merely focusing on their points that may arguably support an obviousness rejection; rather, it further requires considering the conflicts between the references, as required by *Young*. The Examiner failed to address such conflicts in any of the Office Actions, even after being reminded by Applicants. (See Response to the Office Action dated 1/26/01 at p. 3, 4-5, 6; Amendment and Response to the Office Action dated 9/4/01 at p. 4-8.) Instead, the Examiner has affirmatively admitted a failure to follow this standard. (Office Action dated 2/1/02 at p. 9, ¶¶ 14, 15.) Applicants request that the Board consider the impropriety of the Examiner's conduct in light of those standards.

2. The Examiner's argument concerning attacking references individually is not relevant

The Examiner cited cases indicating that non-obviousness is not shown by attacking references individually. Specifically, the Examiner cited *In re Keller*, 642 F.2d 413, 208 U.S.P.Q. 871 (C.C.P.A. 1981) and *In re Merck & Co.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Significantly, those cases addressed an applicant's attempt to distinguish the claimed invention from only one of a combination of references. (*Keller*, 208 U.S.P.Q. at 882 (refuting an attempt to distinguish from only the Walsh reference); *Merck*, 231 U.S.P.Q. at 380 (refuting an attempt to distinguish from only the Petersen reference).) This proposition is not relevant to Applicants' arguments, as Applicants are not attacking individual references as they apply to the invention. Rather, Applicants are attacking the Examiner's decision to combine the references, pointing out that the references conflict with each other and therefore discourage one of ordinary skill in the art from combining them. Thus, while the Examiner's statement of the law may be correct, that law has no bearing on the current facts. Rather, the standards posed in *McLaughlin*,

Young, Interconnect, and *Gore* (requiring consideration of the references as a whole and the effect of their conflicts) are the relevant rules. Applicants request that the Board consider the impropriety of the Examiner's combinations in light of those standards.

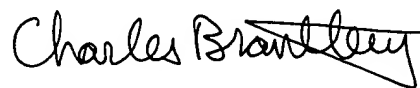
D. Conclusion

Applicants' arguments presented above demonstrate that one of ordinary skill in the art is reasonably apprised of the scope of the invention in claim 60 given the exemplary yet non-limiting embodiments in the Specification. Such apprising is further demonstrated by extrinsic evidence, cited in the previous Response and appended herein, which demonstrates the degree of uncertainty to which one of ordinary skill in the art would be accustomed.

Moreover, concerning the obviousness rejections, Applicants' arguments demonstrate that the Examiner has misinterpreted at least some of the references applied in such rejections. In addition, Applicants' arguments demonstrate that the Examiner has failed to address the conflicts between the references in every proposed combination. In some cases, the Examiner has expressly admitted the failure to do so. Applicants have pointed out that such a failure is legally improper in light of binding case precedent requiring the Examiner to (1) consider each reference as a whole; and (2) consider the effect the references' conflicts would have on the motivation to combine. Applicants have also pointed out that the Examiner's failures suggest that the Examiner used hindsight gained from the current application in making the obviousness rejections, which is counter to binding case precedent as well.

Accordingly, Applicants request that the Board reverse the Examiner, withdraw the rejections, and allow claims 52-64.

Respectfully submitted,

 7/9/12

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Appendix 1: Copy of Involved Claims

52. A method of processing a semiconductor device, comprising:

depositing a dielectric layer over a semiconductor substrate, said substrate comprising a plurality of electrically conductive regions and an electrically insulative region therebetween;

allowing electrically chargeable particles to occur in said dielectric layer;

allowing some diffusion of said electrically chargeable particles; and

preventing at least some of said electrically chargeable particles from reaching said substrate.

53. A method of processing a semiconductor device, comprising:

depositing a dielectric layer over a semiconductor substrate, wherein said step of depositing a dielectric layer comprises depositing a dielectric layer using an organic precursor;

allowing electrically chargeable particles to occur in said dielectric layer, wherein said step of allowing electrically chargeable particles to occur in said dielectric layer comprises allowing an organic component of said organic precursor to deposit in said dielectric layer;

allowing some diffusion of said electrically chargeable particles; and

preventing at least some of said electrically chargeable particles from reaching said substrate, wherein said preventing step comprises layering a barrier over said substrate using a non-organic precursor prior to said step of depositing a dielectric layer.

54. The method in claim 53, wherein said layering step comprises layering a barrier using silane.

55. A method of at least partially forming a circuit device, comprising:

providing a semiconductor substrate;

layering a carbon-free barrier on said substrate; and

layering a carbon-containing dielectric on said barrier.

56. The method in claim 55, wherein said step of layering a carbon-free barrier on said substrate further comprises layering said carbon-free barrier using a plasma.

57. The method in claim 56, further comprising a step of heating said carbon-containing dielectric.

58. The method in claim 57, wherein said step of heating said carbon-containing dielectric comprises raising a temperature of said dielectric to a range of 850° C to 1050° C for at least 5 seconds.

59. The method in claim 57, wherein said step of heating said carbon-containing dielectric comprises raising a temperature of said dielectric to a range of 750° C to 1000° C for at least 5 minutes.

60. A method of processing a substrate comprising two active areas and an intervening insulating region, said method comprising:

depositing an oxide charge barrier over said substrate;
depositing a generally insulative material over said oxide charge barrier, wherein
said generally insulative material is less insulative than said barrier; and
providing a generally conductive element over said generally insulative material,
wherein said element is generally laterally coextensive with said intervening
insulating region.

61. The method in claim 60, wherein said step of depositing a generally insulative material comprises depositing a generally insulative material that is allowed to comprise oxide charges.

62. The method in claim 61, further comprising a step of plasma treating said substrate prior to said step of depositing an oxide charge barrier.

63. The method in claim 61, further comprising:

annealing said generally insulative material;
allowing an oxide charge in said generally insulative material to migrate toward
said substrate in response to said annealing step; and
intercepting said oxide charge with said oxide charge barrier before said oxide
charge reaches said substrate.

64. The method in claim 61, further comprising refraining from depositing any generally conductive material before said step of depositing a generally insulative material.

Appendix 2

Amendment and Response to the Office Action dated 9/4/01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Thakur et al.

Serial No.: 09/654,093

Filed: August 31, 2000

For: A METHOD TO AVOID THRESHOLD VOLTAGE SHIFT
IN THICKER DIELECTRIC FILMS

§
§ Group Art Unit: 2815
§
§ Examiner: P. Brock II
§
§ Atty. Docket: 94-0302.02
§
§
§
§

Commissioner for Patents
Washington, D.C. 20231

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Washington, DC 20231 on

Date 12/1

Signature

AMENDMENT AND RESPONSE TO THE
OFFICE ACTION DATED SEPTEMBER 4, 2001

Dear Sir:

Applicants submit this Amendment and Response to the Office Action of September 4, 2001. please amend the above-captioned application as follows.

IN THE CLAIMS

Please amend the claims to the form indicated below.

52. (Once amended) A method of processing a semiconductor device, comprising:
- depositing a dielectric layer over a semiconductor substrate, said substrate comprising a plurality of electrically conductive regions and an electrically insulative region therebetween;
 - allowing electrically chargeable particles to occur in said dielectric layer;
 - allowing some diffusion of said electrically chargeable particles; and

preventing at least some of said electrically chargeable particles from reaching said substrate.

53. (Once amended) A method of processing a semiconductor device, comprising:
- depositing a dielectric layer over a semiconductor substrate, wherein said step of depositing a dielectric layer comprises depositing a dielectric layer using an organic precursor;
 - allowing electrically chargeable particles to occur in said dielectric layer, wherein said step of allowing electrically chargeable particles to occur in said dielectric layer comprises allowing an organic component of said organic precursor to deposit in said dielectric layer;
 - allowing some diffusion of said electrically chargeable particles; and
 - preventing at least some of said electrically chargeable particles from reaching said substrate, wherein said preventing step comprises layering a barrier over said substrate using a non-organic precursor prior to said step of depositing a dielectric layer.

A marked-up version of these claims appears in Appendix 1 of this Amendment and Response.

REMARKS

Claims 52-64 are pending.

Claims 52-64 are rejected.

Claims 52-53 are amended

Applicants request the reconsideration of claims 52-64.

I. Rejection of claim under §112

Claim 60 refers to a “generally insulative material” and a “generally conductive element” that is “generally laterally coextensive” with an intervening insulating region. The Examiner argued that the term “generally” lacks support in the Specification and that one of ordinary skill

in the art would not be reasonably apprised of the scope of the invention given that term. As a result, the Examiner found the claim to be indefinite. Applicants contend that the Examiner is wrong on both counts. Concerning the phrase “generally insulative material,” one of ordinary skill in the art would define an insulator to be

[a] material that, *ideally*, conducts no electricity; it can therefore be used for isolation and protection of energized circuits and components Actually, *no insulator is perfectly nonconductive*

. . . .

(Gibilisco, THE ILLUSTRATED DICTIONARY OF ELECTRONICS (6th ed. 1994)(defining the term “insulator”)(emphasis added). A copy of the relevant page of the DICTIONARY is included in Appendix 2 of this Amendment and Response.) Thus, one of ordinary skill in the art would understand that the term “generally” as used in the phrase “generally insulative material” acknowledges the lack of an ideal and perfect insulator. Moreover, the Specification provides non-limiting yet supporting examples of a “generally insulative material” in the form of a dielectric layer incorporating an oxide charge and a contaminant; wherein the dielectric layer may be BPSG, BSG, PSG, or silicon dioxide; the oxide charge may be positive or negative; and the contaminant may be carbon. As a result, the Specification provides further guidance to one of ordinary skill in the art as to what a “generally insulative material” may be.

Similarly, concerning the phrase “generally conductive element,” one of ordinary skill in the art would define a conductor to be a “material which conducts electricity with *ease*.” (DICTIONARY (defining the term “conductor”)(emphasis added). A copy of the relevant page of the DICTIONARY is included in Appendix 2 of this Amendment and Response.) Based on this definition, one of ordinary skill in the art accepts that a conductor is a material that *easily* conducts electricity. Applicants contend that claim 60’s use of the term “generally” is no less definite than the term “easily,” which is considered to be sufficiently definite in the art. Further, such an artisan would understand that “[v]arious materials *vary widely* in their suitability as conductors.” (*Id.*) Therefore, such an artisan understands that the term “generally” as used in the phrase “generally conductive element” also acknowledges the wide variance of conductivity exhibited by various materials.

As for claim 60’s generally conductive element being “generally laterally coextensive” with an intervening insulating region, Applicants contend that non-limiting support for that term

may be found in FIGS. 1 and 3 of the Application and the Specification's text describing those figures, wherein a lead 26 is above an insulating region 14 yet, as the cross-sections illustrate, need not extend laterally to the same mathematically exact degree as does the insulating region 14. Guided by such disclosure, Applicants assert that one of ordinary skill in the art would understand the term "generally" as used in the phrase "generally laterally coextensive"

As a second basis for rejecting claim 60 under §112, the Examiner argued that its term "intervening insulating region" lacked antecedent basis. The proper antecedent basis may be found in claim 60's preamble, which refers to "an" intervening insulating region.

II. Rejection of claim under §102

The Examiner rejected claim 52 as being anticipated by Doan (U.S. Patent 5,372,974). Applicants have amended claim 52 to clarify its distinction from the matters disclosed in Doan. Specifically, claim 52 requires depositing a dielectric layer over a semiconductor substrate, the substrate *comprising a plurality of electrically conductive regions and an electrically insulative region therebetween*. Applicants contend that Doan fails to disclose such a limitation and therefore fails to anticipate claim 52.

III. Rejection of claims under §103

The Examiner rejected various groups of claims based on various combinations of references. Applicants address each basis for rejection separately below.

A. Rejection of claims based on Doan and Cunningham

The Examiner rejected claims 53-57 as obvious in light of Doan in combination with Cunningham (U.S. Patent 5,468,689). However, an obviousness rejection requires that the multiple prior art references suggest to one of ordinary skill in the art to combine the references. (See *United States Surgical Corp. v. Ethicon Inc.*, 103 F.3d 1554, 1564, 41 U.S.P.Q.2d 1225, 1233 (Fed. Cir. 1997), *cert. denied*, 522 U.S. 950 (1997).) Further, when the prior art contains conflicting references, the ability of each reference to suggest solutions to one of ordinary skill in

the art must be considered. (*See In re Young*, 927 F.2d 588, 18 U.S.P.Q. 1089 (Fed. Cir. 1991).) (Copies of these cases are included in Appendix 3 to this Amendment and Response.) Applicants contend that while the Examiner attempted to present a motivation for combining Doan and Cunningham, those references conflict with each other so greatly that any motivation to combine is untenable. In fact, the references motivate one of ordinary skill in the art to avoid their combination.

Cunningham, for instance, touts concern over material cracking during reflow. (Cunningham at col. 1, ln. 45-53.) As a result, Cunningham teaches providing a nitride barrier 14 over its "top" layer 13. (*Id.*; see also col. 3, ln. 21-38; FIG. 1.) Significantly, however, Cunningham does not provide its nitride barrier between layers that comprise its stack. (*Id.*) Thus, one of ordinary skill in the art is lead to believe that there is no need for such a barrier in those location and hence, no cracking issues there.

On the other hand, Doan, which also expresses concern over material cracking during reflow, indicates that cracking between layers of the stack is a major problem. Specifically, Doan teaches providing a nitride barrier between each and every layer of its stack. (Doan at col. 4, ln 28- col. 5, ln. 9; FIGS. 6-7.) Thus, in light of Cunningham, Doan appears to one of ordinary skill in the art to require unnecessary redundancy in terms of barrier layers, thereby adding unnecessary time, money, and effort to the fabrication process. Conversely, in light of Doan, Cunningham appears to the artisan to leave its device susceptible to the very cracking problem Cunningham seeks to avoid. Given such fundamental conflicts, Applicants assert that the references lack the ability to suggest solutions to one of ordinary skill in the art and in fact discourage their combination. Thus, without a legally proper motivation to combine, the obviousness argument against claims 53-57 fails. Accordingly, the only amendment to claim 53 has been to put it in independent form by expressing the limitations originally presented in claim 52.

B. Rejection of claims based on Doan, Cunningham, and Ying

The Examiner rejected claims 58 and 59 as obvious in light of Doan and Cunningham in combination with Ying (U.S. Patent 5,384,288). In fact, the Examiner's reasoning is essentially the same as that used to reject these claims in the last office action, based on the combination of

Doan and Ying alone. (Office Action dated 1/26/01 at p. 3-4.) In response to the prior rejection, Applicants pointed out the inconsistencies between Doan and Ying that would discourage combination. (Amendment and Response submitted 7/26/01.) Applicants contend that their earlier argument, which need not be repeated here, applies equally to the current rejection and that adding Cunningham to the combination does not cure the fundamental conflicts between Doan and Ying.

In fact, adding Cunningham exacerbates the conflicts between the references in the attempted combination. As discussed in part (A) above, Doan and Cunningham also conflict on a fundamental level, indicating a further lack of their ability to suggest solutions to one of ordinary skill in the art and further discouraging the proposed Doan/Cunningham/Ying combination. In addition, Cunningham and Ying also conflict. Significantly, the processes taught in both references require a barrier material such as a nitride. Cunningham requires that its nitride barrier 14 expose a portion of a silicon substrate 1 in order to grow GaAs thereon. (Cunningham at col. 3, ln. 21-38; FIG. 1.) Ying, on the other hand, requires that its nitride barrier 14 expose none of the substrate 10 in order protect the substrate 10 from subsequent process. (Ying at col. 3, ln. 18-28; FIGS. 1A-1C.) Thus, one of ordinary skill in the art attempting to combine the references would achieve a Cunningham-type device with a continuous nitride barrier that covers the substrate and hinders the desirable growth of GaAs. Alternatively, the artisan would achieve a Ying-type device having a nitride barrier that exposes the substrate, thereby allowing undesirable deterioration during subsequent processing. Either combination is unworkable and hence provides further discouragement in attempting a Doan/Cunningham/Ying combination.

C. Rejection of claims based on Doan and Ghezzi

The Examiner rejected claims 60-61 and 63-64 as being obvious in light of Doan in combination with Ghezzi (U.S. Patent 5,132,239). In fact, the Examiner's reasoning is the same as that used to reject these claims in the last office action. (Office Action dated 1/26/01 at p. 4-5.) Applicants responded to the rejection, pointing out the inconsistencies between Doan and Ghezzi that would discourage combination. (Amendment and Response submitted 7/26/01.) Applicants contend that their earlier argument, which need not be repeated here, applies equally to the

current rejection. In the latest Office Action, the Examiner failed to consider the conflicts between the references highlighted by Applicants, as required by the rule in *Young* (18 U.S.P.Q. 1089). Moreover, the Examiner admitted that hindsight was used to determine obviousness, and claimed that other case precedent justified that action.

Specifically, the Examiner cited *In re McLaughlin* (443 F.2d 1392, 170 U.S.P.Q. 209 (C.C.P.A. 1971)) for support. However, *McLaughlin* actually favors Applicants in that it highlights the Examiner's failure to meet the *prima facie* burden for this and all of the other obviousness rejections. *McLaughlin* emphasizes that, in considering whether to combine references for an obviousness rejection, the Examiner must consider what the references "*taken as a whole* would suggest to one of ordinary skill in the art." (*McLaughlin*, 170 U.S.P.Q. at 212 (emphasis added).) Applicants assert that considering the references as a whole necessitates more than merely focusing on their points that may arguably support an obviousness rejection; rather, it further requires considering the conflicts between the references, as required by *Young*. The Examiner failed to address such conflicts, either in the first Office Action (dated 1/26/01) or, after being reminded by Applicants, in the last Office Action. Hence, the Examiner has failed to satisfy the standards set forth by the very case precedent cited by the Examiner.

Moreover, the Examiner's failure to address the conflicts between the references suggests that the Examiner has ignored those conflicts and somehow been able to focus on certain aspects of the references that justify, in the Examiner's mind, the rejection of the relevant claims. Applicants submit that the guidance for such focus can only come from the current application. In using the current application in such a manner, the Examiner has violated another tenet of *McLaughlin*, which requires that the "[j]udgment on obviousness . . . not include knowledge gleaned only from applicant's disclosure." (*McLaughlin*, 170 U.S.P.Q. at 212.) Thus, the conflicts within the Doan/Ghezzi combination and the Examiner's failure to address those conflicts warrant a withdrawal of any rejection relying on that combination.

D. Rejection of claim based on Doan, Ghezzi, and Van Der Scheer

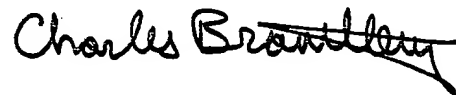
The Examiner rejected claim 62 as being obvious in light of Doan and Ghezzi in combination with Van Der Scheer (U.S. Patent 4,976,856). As with the rejection addressed in part (C) above, the Examiner raised essentially the same rejection and offered the same

supporting argument in the last office action as in the first Office Action. (See Office Action dated 1/26/01 at p. 6.) As a further parallel with part (C), Applicants responded to the rejection, pointing out the inconsistencies between the references. Specifically, Applicants noted that each reference in the proposed combination conflicts with the other two references in the combination. Applicants contend that the response still supports the patentability of the claim yet will not repeat the arguments here to avoid redundancy. This is especially appropriate as – just as in part (C) above – the Examiner has still failed to consider those conflicts in attempting to address the motive to combine. Accordingly, the consequences and result are the same here as in part (C): the Examiner's failure to address the conflicts between the references suggests that the Examiner has failed to consider the references as a whole, ignored those conflicts, and been able to focus on certain aspects of the references based on knowledge gleaned from the current application; thus, the Examiner's conduct fails to satisfy the standards set forth in *McLaughlin* and *Young*, which warrants a withdrawal of this rejection.

CONCLUSION

In light of the above remarks, Applicants submit that claims 52-64 are allowable over the applied references. Therefore, Applicants respectfully request reconsideration of the Examiner's rejections and further requests allowance of all of the pending claims. If there are any matters which may be resolved or clarified through a telephone interview, the Examiner is requested to contact Applicants' undersigned attorney at the number indicated.

Respectfully submitted,



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Appendix 1: Marked-up version of amended claims

52. (Once amended) A method of processing a semiconductor device, comprising:

depositing a dielectric layer over a semiconductor substrate, said substrate comprising a plurality of electrically conductive regions and an electrically insulative region therebetween;

allowing electrically chargeable particles to occur in said dielectric layer;

allowing some diffusion of said electrically chargeable particles; and

preventing at least some of said electrically chargeable particles from reaching said substrate.

53. (Once amended) [The method in claim 52, wherein:] A method of processing a semiconductor device, comprising:

depositing a dielectric layer over a semiconductor substrate, wherein said step of

depositing a dielectric layer comprises depositing a dielectric layer using a organic precursor;

allowing electrically chargeable particles to occur in said dielectric layer, wherein said

step of allowing electrically chargeable particles to occur in said dielectric layer comprises allowing an organic component of said organic precursor to deposit in said dielectric layer;

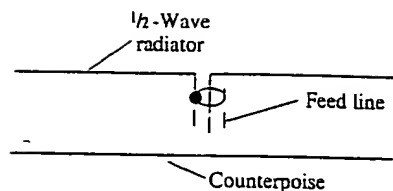
allowing some diffusion of said electrically chargeable particles; and

preventing at least some of said electrically chargeable particles from reaching said

substrate, wherein said preventing step comprises layering a barrier over said substrate using a non-organic precursor prior to said step of depositing a dielectric layer.

Appendix 2

Gibilisco, THE ILLUSTRATED DICTIONARY OF ELECTRONICS (6th ed. 1994)(defining the terms
“conductor” and “insulator”)



condenser antenna

making the output current alternate accordingly. Also called *capacitor microphone*.

condensing routine A computer program that takes an object (user written) program from an internal or external memory to punched cards in a way that maximizes the cards' storage capacity.

condensite A plastic insulating material whose base is phenol formaldehyde resin.

conditional Dependent on some external factor, and therefore subject to change.

conditional branch The point in a computer program where a relational test is performed and the statement line in which the test is made is left so that an out-of-sequence instruction can be implemented. Such a branch might be made, for example, following the BASIC statement "if $Z = Y$ then go to (another line in the program)."

conditional branch instruction The instruction in a computer program that causes a conditional branch.

conditional implication operation A Boolean operation in which the result of operand values a and b are such that the output is high only if input a is high and input B is low. Also called *inclusion, if-then operation*.

conditional jump See **CONDITIONAL BRANCH**.

conditional stop instruction In a computer program, an instruction that can cause a halt in the run, as dictated by some specified condition.

conditional transfer See **CONDITIONAL BRANCH INSTRUCTIONS**.

condition code A set of constraints for a computer program. The condition code sets the limits on what can be done with the computer under certain circumstances.

conditioning 1. The process of making equipment compatible for use with other equipment. Generally involves some design or installation changes. 2. Interfacing.

Condor A continuous-wave navigational system giving a cathode-ray-tube display for automatically determining the bearing and distance from a ground station. Compare **BENITO**.

conductance Symbol, G . Unit, siemens. The ability of a circuit, conductor, or device to conduct electricity. Conductance is the reciprocal of resistance $G = 1/R = I/E$.

conducted heat Heat transferred by conduction through a material substance, as opposed to convection (movement of matter) and radiation (which

occurs through empty space). A heat sink conducts dissipated energy away from a transistor, for example.

conducting layer See **KENNELLY-HEAVISIDE LAYER**.

conduction 1. The propagation of energy through a medium, depending on the medium for its travel. 2. The transfer of electrons through a wire. 3. The transfer of holes through a P-type semiconductor material. 4. Heat transfer through a material object (see **CONDUCTED HEAT**).

conduction angle See **ANGLE OF CONDUCTION**.

conduction band In the arrangement of energy levels within an atom, the band in which a free electron can exist; it is above the valence band in which electrons are bound to the atom. In a metallic atom, conduction and valence bands overlap; but in semiconductors and insulators, they are separated by an energy gap.

conduction current 1. The electromagnetic-field flow that occurs in the direction of propagation. A measure of the ease with which the field is propagated. 2. Current in a wire or other conductor.

conduction-current modulation In a microwave tube, cyclic variations in the conduction current; also, the method of producing such modulation.

conduction electron See **FREE ELECTRON**.

conduction error In a temperature-acutated transducer, error caused by conduction of heat between the sensor and the mounting.

conduction field An energy field that exists in the vicinity of an electric current.

conductive coating A conducting layer applied to the glass envelope of a cathode-ray tube, such as an oscilloscope tube or picture tube. Also see **AQUADAG**.

conductive coupling See **DIRECT COUPLING**.

conductive material See **CONDUCTOR**.

conductive pattern The pattern of conductive lines and areas in a printed circuit.

conductivity Symbol, Σ . Unit, S/m (siemens per meter). Specific conductance, i.e., conductance per unit length. Conductivity is the reciprocal of resistivity: $\Sigma = 1/\rho$.

conductivity meter A device for measuring electrical conductivity. Generally, such a device is calibrated in mhos.

conductivity modulation In a demiconductor, the variation in conductivity resulting from variation of charge-carrier density.

conductivity-modulation transistor A transistor in which the bulk resistivity of the semiconductor material is modulated by minority carriers.

conductor 1. A material which conducts electricity with ease, such as metals, electrolytes, and ionized gases. Various materials vary widely in their suitability as conductors; the conductivity of commercial copper, for example, is almost twice that of aluminum. Compare **INSULATOR**. 2. An individual conducting wire in a cable, insulated or uninsulated.

conduit A hollow tube, made of plastic or metal,

insulated-gate field-effect transistor Abbreviation, IGFET. See METAL-OXIDE SILICON FET.

insulated resistor A resistor around which is molded a nonconducting material, such as vitreous enamel or a plastic.

insulating tape Electrical insulation in the form of a thin, usually adhesive, strip of fabric, paper, or plastic.

insulation 1. A coating of dielectric material that precludes a short circuit between a conductor and the surrounding environment. 2. The application of a dielectric coating to an electrical conductor. 3. Electrical separation between or among different components, circuits, or systems.

insulation breakdown Current leakage through, and rupture of, an insulating material because of high voltage stress.

insulation ratings Collectively, the dielectric constant, dielectric strength, power factor, and resistivity of an insulating material. Sometimes included are such physical properties as rupture strength, melting point, and so on.

insulation resistance The very high resistance exhibited by a good insulating material. It is expressed in megohms (or higher units of resistance) for a sample of material of stated volume or area.

insulation system Collectively, the materials needed to insulate a given electronic device.

insulator 1. A material that, ideally, conducts no electricity; it can therefore be used for isolation and protection of energized circuits and components (*also see* DIELECTRIC). Actually, no insulator is perfectly nonconductive (*see, for example, INSULATION RESISTANCE*). 2. Any body made from an insulating material.

insulator arcover A sudden arc, or flow of current, over the surface of an insulator, because of excessive voltage.

integer A whole number, as opposed to a fraction or mixed number.

integral 1. Symbol, \int . 1. The sum of an infinite series of values (increments) making up a quantity. Thus, $\int dx = x$. Compare DIFFERENTIAL. *Also see* DEFINITE INTEGRAL, INDEFINITE INTEGRAL, INTEGRAL CALCULUS, and INTEGRATION. 2. The part of a number to the left of the radix point.

integral action In automatic control practice, a control action delivering a corrective signal proportional to the time the controlled quantity has differed from a desired value.

integral calculus The branch of mathematics concerned with the theory and applications of integration. *Also see* DEFINITE INTEGRAL; INDEFINITE INTEGRAL; INTEGRAL; INTEGRATION. Like differential calculus, integral calculus is a powerful tool in electronics design.

integral contact In a relay or switch, a contact that carries current to be switched.

integral-horsepower motor A motor rated at 1 horsepower.

integral multiple A whole multiple of a number. Thus, a harmonic is an integral multiple of a fundamental frequency f : $2f$, $5f$, $10f$, and so on.

integral number See INTEGER.

integrand A function or equation which is to be integrated. Thus, in the integral expression $\int y dx$, the integrand is $y dx$. *Also see* INTEGRAL; INTEGRAL CALCULUS; INTEGRATION.

integrate 1. To perform the function of mathematical or electrical integration. 2. To construct a circuit on a piece of semiconductor material.

integrated Constructed on a single piece of material, such as a semiconductor wafer.

integrated amplifier An AF amplifier having a preamplifier, intermediate amplifier, and output amplifier on a single chassis.

integrated capacitor In an integrated circuit, a fixed capacitor in which one "plate" is a layer of material diffused into the substrate; the dielectric, a thin oxide film grown on top of the first layer; and the other plate, a metal layer deposited on top of the oxide film.

integrated circuit Abbreviation, IC. A circuit whose components and connecting "wires" are made by processing distinct areas of a chip of semiconductor material, such as silicon. Integrated circuits are classified according to construction, a few being monolithic, thin-film, and hybrid.

integrated data processing Abbreviation, IDP. The detailed electronic classification, sorting, storage, and mathematical processing of data within a coordinated system of equipment, usually at one location.

integrated electronics That branch of electronics that is concerned with the design and fabrication of integrated circuits.

integrated resistor See DIFFUSED-LAYER RESISTOR.

integrating circuit See INTEGRATING NETWORK.

integrating galvanometer A device for measuring the change in electric flux produced in a coil in an electric field. Even very slow changes can be measured.

integrating meter An instrument whose indication is a summation (usually) of an electrical quantity that is time-dependent, e.g., ampere-hour meter, watt-hour meter.

integrating motor An electric motor that follows the integral of the input signal; the angle of rotation of the motor shaft is equal to the integral of an input waveform.

integrating network A four-terminal RC network (series resistor, shunt capacitor) whose output voltage is (or is proportional to) the time integral of the input voltage. Compare DIFFERENTIATING NETWORK.

integrating photometer An indicating photometer whose reading is the average candlepower at all angles in one plane.

integration Finding a function when its derivative is given. Integration is the inverse of differentia-

Appendix 3:

Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 227 U.S.P.Q. 543 (Fed. Cir. 1985)

▽

Interconnect Planning Corporation
v.
Feil, et al.

Court of Appeals, Federal Circuit

Nos. 84-1467 and 85-565

Decided October 9, 1985

United States Patents Quarterly Headnotes

PATENTS

[1] Estoppel -- As to validity -- In general (§ 35.151)

Federal district court decision on patent validity, which was not final, not certified, not appealed, and mooted by subsequent events, does not collaterally estop appeal of those aspects of subsequent decision on reissue of patent which are "common to" earlier decision, since current appeal involves validity of claims of reissue patent, which was issue that did not exist at time of decision on validity of original patent claims.

PATENTS

[2] Patentability -- Anticipation -- In general (§ 51.201)

Reissue -- In general (§ 58.1)

Patent's reissuance with claims that are not substantially identical to original claim requires evaluation of invention as whole, as currently claimed, in terms of 35 USC 103, and original claims, whether valid or invalid, are not prior art against reissued claims.

PATENTS

[3] Patentability -- Aggregation or combination -- In general (§ 51.151)

Federal district court erred by treating each prior art reference as teaching one or more of specific components for use in claimed system, even though such system did not then exist.

PATENTS

Particular patents -- Telephone Switches

Re. 31,144, Feil, Multi-Station Telephone Switching System, holding of invalidity vacated.

***543** Appeal from District Court for the Southern District of New York, Duffy, J.; 223 USPQ 961.

Action by Interconnect Planning Corporation, against

Thomas E. Feil, Robert O. Carpenter, V Brand, Inc., and Turret Equipment Corp., [FNa1] for patent infringement and unfair competition, in which defendants counterclaim ***544** for declaration of patent invalidity. From decision granting defendants' motion for summary judgment, plaintiff appeals. Vacated and remanded.

Alfred P. Ewert, and Morgan, Finnegan, Pine, Foley & Lee, both of New York, N.Y. (Jerome G. Lee, Robert A. Molan, and Richard J. McGrath, on the brief, and Howard Karasik, and Sherman & Citron, P.C., both of New York, N.Y., of counsel) for appellant.

Lawrence G. Kurland, and Hubbell, Cohen, Steifel & Gross, P.C., both of New York, N.Y. (Lance J. Lieberman, Daniel L. Dolgin, Towne, Dolgin, Sawyer & Horton, Peter P. Stern, Theodore S. Steingut, and Berger, Steingut, Weiner, Fox & Stern, all of New York, N.Y., on the brief) for appellees.

Before Davis, Smith, and Newman, Circuit Judges.

Newman, Circuit Judge.

Interconnect Planning Corporation (IPC) appeals from the summary judgment of the United States District Court for the Southern District of New York, *Interconnect Planning Corp. v. Feil*, 587 F.Supp. 1495, 223 USPQ 961 (S.D.N.Y. 1984), holding invalid all the claims of IPC's Reissue Patent No. 31,144 entitled "Multi Station Telephone Switching System," invention of Thomas E. Feil, for failure to meet the conditions for patent validity under 35 U.S.C. § 103, and dismissing IPC's count for patent infringement. We hold that invalidity under § 103 has not been proven, as a matter of law. We vacate the summary judgment of invalidity and dismissal of the infringement count, and remand to the district court.

Background

The claims of Reissue Patent No. 31,144 are for certain telephone systems known as "trader turrets", which are multi-line telephone consoles used by the financial community in trading networks for securities, commodities, currency, and the like. The purpose of these systems is to facilitate concurrent telephone connections for traders requiring multiple sources of price information, conducting multiple transactions, and generally meeting the communication demands of

busy, often hectic, financial trading enterprises. Trading rooms may house a hundred or more trader turrets.

Because of the large number of lines and connections required and the specific needs of these communication networks, these systems are complex. A high degree of reliability is required in their operation, because even momentary failures can be extremely costly.

The record shows that the Feil trader turrets rapidly achieved commercial success, displacing other systems then in use. IPC attributes the success of the Feil invention to its novel system "architecture", which enabled ease of operation, high capacity, and improved reliability over the systems then available. IPC's sales of the Feil trader turrets, according to the record, grew from \$320,000 for 20 units in 1974, its first year, to \$27,900,000 for 3500 units in 1983.

Thomas Feil, the inventor, was formerly an officer and part owner of IPC. In 1977 Mr. Feil formed the defendant company V Band Systems, Inc., and in 1980 Mr. Feil left IPC and joined V Band, of which he is president and chief executive officer. Defendants make and sell the trader turrets that are here accused of patent infringement.

On November 21, 1980, IPC filed suit in the Southern District of New York asserting infringement of U.S. Patent No. 3,991,282 (the '282 patent), invention of Thomas Feil. Defendants Feil and V Band raised the defense this patent was invalid in terms of 35 U.S.C. § 103. IPC's count for unfair competition was dismissed by the court and is not before us. Various counterclaims were separated and are apparently still pending.

In May of 1981 IPC filed in the U.S. Patent and Trademark Office (the PTO) an application to reissue the '282 patent. IPC cited to the examiner articles by M.E. Ozenberger and W.H. Keith, both of the Bell Telephone Laboratories, on which articles defendants were relying before the district court, and which had not previously been before the examiner. The district court refused to stay the action before it pending completion of the reissue examination, and therefore the reissue examination was suspended by the PTO in accordance with its rules. On defendants' motion for summary judgment, the district court on June 1, 1982 held all claims of the '282 patent invalid for obviousness under 35 U.S.C. § 103. *Interconnect Planning Corp. v. Feil*, 543 F.Supp. 610, 614-19, 215

USPQ 734, 736-41 (S.D.N.Y. 1982).

Following this decision, at IPC's request the PTO resumed examination of the reissue application. The court's decision was provided to and considered by the examiner. A supplemental *545 reissue declaration by IPC referred to this decision as a basis for the reissue application. The '282 patent was surrendered, and on February 8, 1983 the PTO granted the reissue patent, RE 31,144, IPC having restricted its claims in various ways and having overcome the newly cited prior art.

Defendants moved for summary judgment of invalidity of the reissue patent, asserting collateral estoppel based on the court's decision on the '282 patent, and also asserting invalidity under 35 U.S.C. § 103. IPC resisted the motion, and the parties' memoranda, affidavits, depositions, and other documents are of record. For reasons similar to those of the 1982 decision, the motion for summary judgment was granted on June 20, 1984.

That decision, holding all of the reissue claims invalid, was certified and made final under Fed. R. Civ. P. 54(b), with instructions by the court that IPC "attempt to have any appeal . . . heard at the same time and before the same panel" as any appeal from a decision on the same patent by the United States District Court for the District of New Jersey. [FN1] We agreed. Both appeals are decided this day.

Although both appeals involved similar issues and argument, specific to the New York suit are certain procedural issues, as discussed infra.

Collateral Estoppel

Defendants argue that IPC's appeal rights are curtailed on the basis of collateral estoppel. Two separate but related issues of estoppel are raised, both arising out of the district court's 1982 decision on the '282 patent.

A.

Defendants assert first that IPC can not now appeal from or argue those aspects of the 1984 decision on the reissue patent which are "common to" the 1982 decision on the '282-patent, on the ground that those aspects could have been appealed earlier, and that it is too late to do so now. IPC asserts in response that (1) the issues are not the same, (2) a different patent is involved, and (3) the 1982 decision was not final.

Considering the finality issue, for collateral estoppel to arise the prior decision need not have been final in the sense of 28 U.S.C. §1291 but, in the words of the Restatement, the prior adjudication must have been "sufficiently firm to be accorded conclusive effect". Restatement (Second) of Judgments § 13 (1982). Sufficient firmness, according to the Restatement, requires that the party against whom the estoppel is asserted have had the right, even if not exercised, to challenge on appeal the correctness of the earlier decision. Restatement (Second) of Judgment, § 13 reporter's note comment f (1982). Defendants argue that IPC had three such opportunities: appeal under 28 U.S.C. § 1292(a)(1), which governs appeals from interlocutory orders involving injunctions; appeal under 28 U.S.C. § 1292(c)(2), which governs appeals in patent infringement cases final except for an accounting; and appeal under Fed.R.Civ.P. 54(b), which governs judgment on fewer than all of multiple claims in an action.

None of these situations controls the case before us. 28 U.S.C. § 1292(a)(1) relates to orders involving injunctions, and although defendants argue that IPC's complaint necessarily invokes this section, this does not impart automatic appealability to interlocutory orders that do not involve injunctions. As for 28 U.S.C. § 1292(c)(2), the district court's judgment was not final except for an accounting, in light of the pendency of counterclaims. 9 J. Moore, B. Ward, & J. Lucas, Moore's Federal Practice, P 110.19[4], at 220 (1985). Fed. R. Civ. Proc. 54(b) requires that the court have expressly directed entry of a final judgment, and that "[i]n the absence of such determination and direction, any [decision] which adjudicates fewer than all the claims . . . shall not terminate the action as to any of the claims". See also 6 Moore's Federal Practice P 54.42, at 813.

Neither IPC nor the defendants asked the district court to enter a final judgment on its decision holding the '282 patent invalid, and the court did not do so. Defendants assert, however, that IPC should now be estopped because it did not move for finality of the ruling nor request that the judgment be certified for interlocutory appeal. An application for certification is by no means certain to be granted and, in this case, IPC's eventual request for certification of the original decision was opposed by defendants and was refused by the court.

The law of collateral estoppel is not intended to penalize a party for declining to try to take a piecemeal appeal. Further, the '282 patent had been placed in

reissue, and an appeal on the merits of patent claims for which reissue was being sought would have been a meaningless exercise, as may have been recognized at the time.

[1] We conclude that the district court's 1982 decision on the '282 patent claims, a *546 decision not final, not certified, not appealed, and mooted by subsequent events, lacks collateral estoppel effect for the purpose urged by defendants. The issue here on appeal is the validity of the claims of the reissue patent, an issue that did not exist at the time of the decision on validity of the '282 patent claims. There is no estoppel against appellate review of all aspects pertinent to the decision on the reissue claims. 1B Moore's Federal Practice P 0.441 [3.-3], at 737.

B.

IPC asserts that the district court incorrectly invoked collateral estoppel when it analyzed the reissue claims by comparing them with the original claims of the '282 patent, then applying prior art only to the differences between the reissue claims and the original claims. Our predecessor court, the U.S. Court of Claims, [FN2] has confronted related situations, wherein estoppel was raised as to unadjudicated claims of a patent whose other claims had been adjudicated in an earlier action. The Court of Claims adopted a pragmatic approach, stating that the first step was to determine whether any new issues were raised as to the nonlitigated claims. In *Westwood Chemical, Inc. v. United States*, 525 F.2d 1367, 1375, 187 USPQ 656 (Ct.Cl. 1975), adopting 186 USPQ 383, 389 (Ct.Cl.Tr.Div. 1975), the court said:

Where obviousness is the basis for the prior invalidity holding, an inquiry into the identity of the validity issue is more properly phrased in terms of the factual inquiries mandated by *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 466-467, 86 S.Ct. 684, 15 L.Ed.2d 545 (1966), as a prerequisite to such a validity determination.

Applying the *Graham* guidelines, the court said:

Thus, the inquiry should be whether the nonlitigated claims present new issues as to the art pertinent to the nonlitigated claims; as to the scope and content of that art; as to the differences between the prior art and the nonlitigated claims; and as to the level of ordinary skill in that art. If none of these inquiries raises any new triable issues, then the obviousness determination in the

prior proceeding should be equally applicable to the nonlitigated claims.

Id. See also *Bourns, Inc. v. United States*, 537 F.2d 486, 199 USPQ 256 (Ct. Cl. 1976), adopting 187 USPQ 174 (Ct. Cl. Tr. Div. 1975); *Carter- Wallace, Inc. v. United States*, 496 F.2d 535, 538, 182 USPQ 172, 175 (Ct. Cl. 1974) (in determining the applicability of the estoppel, the first consideration is "whether the issue of invalidity common to each action is substantially identical.").

The question of substantial identity of reissue claims arose in *Plastic Container Corp. v. Continental Plastics of Oklahoma, Inc.*, 607 F.2d 885, 203 USPQ 27 (10th Cir. 1979), cert. denied, 444 U.S. 1018, 204 USPQ 696 (1980), wherein the court determined that the reissue claims were not substantially identical to the original claims, and therefore that collateral estoppel did not apply.

In *Bourns*, responding to plaintiff's argument that according collateral estoppel effect to non-identical adjudicated claims would amount to treating the claims previously held to be invalid as prior art, the court agreed that this would be inappropriate:

A domino approach in which each successively narrower claim is compared with the one before it, not with the prior art, is inappropriate since it improperly gives prior-art effect to the subject matter of an invalid claim. In *re Craig and Street, Cust. & Pat. App.*, 411 F.2d 1333, 1335, 162 USPQ 157, 158-159 (1969).

537 F.2d at 493, 187 USPQ at 179.

The district court compared the reissue claims with the 282 claims, and erroneously concluded that reissue claims 1 through 6 were substantially identical to the original claims, and that reissue claims 7 through 9, although not substantially identical, involved some substantially identical "issues".

This erroneous legal conclusion may have compounded the error in the next step, wherein the court compared the differences between the original and the reissue claims with prior art that was pertinent only to those differences, thus effectively giving the original claims prior art effect -- the pitfall against which *Bourns* cautioned:

A claim may be invalid for obviousness under 35 U.S.C. § 103 but still describe a combination not

found in the prior art. Moreover, it is well settled that each claim of a patent is entitled to a presumption of validity and is to be treated as a complete and independent invention. 35 U.S.C. § § 282, 288. *Leeds & Catlin v. Victor Talking Machine Co.*, 213 U.S. 301, 319, 29 S.Ct. 495, 53 L.Ed. 805 (1909); *Smith Industries International v. Hughes Tool Co.*, 396 F.2d 735, 736 (5th Cir. 1968).

[2] *547 Id. When a patent has been reissued with claims that are not substantially identical to the original claims, the invention as a whole, as now claimed, must be evaluated in terms of 35 U.S.C. § 103. The original claims, whether valid or invalid, are not prior art against the reissued claims.

The Summary Judgment

The proceeding from which this appeal is taken was styled "summary", in that the court's decision was made on defendants' motion for summary judgment. The earlier decision on the '282 patent was also made on defendants' motion for summary judgment. IPC contends that the matter was inappropriate to summary judgment, in view of the presence of disputed issues of material fact.

Defendants Feil and V Band argued before the district court, and repeat before us, that no material fact is in dispute, that the questions before the district court and before us in this appeal are purely legal ones, and that the issue was properly dealt with summarily. In its discussion of reissue claims 7 through 9, which claims had no counterpart in the original patent, the district court referred to "claims and issues that have not yet been subjected to a full and fair adjudication", 587 F.Supp. at 1500, 223 USPQ at 965; the court viewed both proceedings as "full" as well as fair, a process not always accommodated by summary proceedings on a documentary record.

Obviousness vel non under 35 U.S.C. § 103 is a question of law, whose conclusion requires preliminary determination of several underlying factual issues, as set out in *Graham v. John Deere Co.*, 338 U.S. 1, 148 USPQ 459 (1966). See also *Gardner v. TEC Systems, Inc.* 725 F.2d 1338, 1344-45, 220 USPQ 777, 782-83 (Fed. Cir.) (in banc), cert. denied, 105 S.Ct. 116, 225 USPQ 232 (1984). These factual issues relate to the scope and content of the prior art, the differences between the prior art and the claimed invention as a whole, the level of ordinary skill in the art at the time the invention was made, and the so-called "secondary

considerations" that reflect the contemporaneous response to the invention.

In reviewing IPC's assertions that there were genuine issues of material fact relating to the Graham inquiries, we have reviewed the submissions of the parties. Before the court, according to the record, were all the references cited as prior art; as well as the depositions of Examiner Randall P. Myers of the United States Patent and Trademark Office, engineer John Fitzmaurice of New York Telephone, and inventor/defendant Thomas E. Feil; and various documentary exhibits. Also of record were the affidavits of Alan R. Fitzpatrick, president of American Telecommunications Concepts; IPC's technical experts Dennis Maywald and Herbert Goldwag; Thomas P. Bradbury, vice president and treasurer of IPC; and extensive written submissions and arguments.

Although fact and opinion are intertwined in many of these documents, the factual considerations required by the Graham analysis appear to have been adequately presented in the record. The technological structure and operation of the devices of the prior art were not in material dispute, [FN3] although there was strong dispute about the relationship of the teachings of the references to the problems solved by the Feil system, and the weight to be given to evidence of the Feil invention's commercial success.

The district court stated that expert testimony was unnecessary, *Interconnect Planning Corp. v. Feil*, 587 F.Supp. at 1497, 223 USPQ at 963, and held all of the reissue claims invalid. As will be discussed, we think that the district court reached this conclusion by incorrectly applying the law of 35 U.S.C. § 103.

35 U.S.C. § 103

Those charged with determining compliance with 35 U.S.C. § 103 are required to place themselves in the minds of those of ordinary skill in the relevant art at the time the invention was made, to determine whether that which is now plainly at hand would have been obvious at such earlier time.

The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time.

The invention must be evaluated not through the eyes of the inventor, who may have been of exceptional skill, but as by one of "ordinary skill." See *Stewart-Warner Corp. v. City of Pontiac, Michigan*, 767 F.2d

1563, *548 1570, 226 USPQ 676, 680-81 (Fed. Cir. 1985).

This is not a facile statutory interpretation. The quality of non-obviousness is not easy to measure, particularly when challenged years after the invention was made. That which may be made clear and thus "obvious" to a court, with the invention fully diagrammed and aided, in this case, by a hostile inventor seeking to eliminate his own invention, may have been a breakthrough of substantial dimension when first unveiled.

The judicial application of uniform standards for determining compliance with 35 U.S.C. § 103 is essential, because the technological incentives fostered by the patent system depend on consistent interpretation of the law. To this end, faithful adherence to the patent statute and guiding precedent fosters uniformity in result.

A.

Following examination by the Patent and Trademark Office, a duly issued patent is presumed valid, as is a duly reissued patent. The burden of proving otherwise resides with the person challenging its validity. 35 U.S.C. §282.

This statutory presumption derives in part from recognition of the technological expertise of the patent examiners. A reissue application receives a fresh examination, normally concentrated on those references and reasons that occasioned its filing. The record shows that this reissue application received a supplemental internal review by three examiners because it was involved in litigation.

Although IPC's view is incorrect that the PTO's decision must be given controlling weight, we do agree that the examination procedure and result should be given appropriate consideration and due weight by the court. As stated in *Fromson v. Advance Offset Plate, Inc.*, 755 F.2d 1549, 1555, 225 USPQ 26, 31 (Fed. Cir. 1985), "[t]he Examiner's decision, on an original or reissue application, is never binding on the court. It is, however, evidence the court must consider in determining whether the party asserting invalidity has met its statutory burden by clear and convincing evidence".

Upon reissue the "burden of proving invalidity was made heavier", as stated in *Fromson*, supra. This burden must be met by the party asserting invalidity.

The district court here relied on the identical references that had been before the reissue examiners, and disdaining the need for expert testimony, reached a different conclusion in law. Although we affirm the obligation of the district court to reach an independent conclusion, the reissue patent reaches the court clothed in a statutory presumption of validity, and clear and convincing evidence is required to surmount this presumption. *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1359-60, 220 USPQ 763, 770 (Fed. Cir.), cert. denied, 105 S.Ct. 95, 224 USPQ 520 (1984).

B.

The court referred to the content of the prior art references in broad terms, occasionally using the title of a reference to explain its pertinence. In this crowded art of telephone systems, as IPC correctly pointed out, it is not enough to show that each of the components used by Feil was known, and had been used in other telephone systems. Feil did not claim to have invented any of the components of his claimed system.

[3] From its discussion of the prior art it appears to us that the court, guided by the defendants, treated each reference as teaching one or more of the specific components for use in the Feil system, although the Feil system did not then exist. Thus the court reconstructed the Feil system, using the blueprint of the Feil claims. As is well established, this is legal error. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 774, 218 USPQ 781, 791 (Fed. Cir. 1983), cert. denied, 104 S.Ct. 1284, 224 USPQ 520 (1984).

Illustrative is the court's analysis of reissue claim 1. Pertinent is not only its analysis of the differences between the reissue claim and the prior art, but also the differences between the reissue claim and the original claim. In claim 1, matter enclosed in brackets appeared in the original claim but forms no part of the reissue claim, and matter printed in italics was added by reissue:

1. For a telephone system in which telephone communication is capable of being established for each telephone station of a plurality of telephone stations over a standard telephone line by directly connecting each telephone station to a selected standard telephone line of a plurality of standard telephone lines, each of said plurality of standard telephone lines capable of being directly connected to each of said plurality of telephone stations, an

improvement comprising:

a plurality of pairs of contacts, with respective pairs of said contacts being connected with respective ones of said standard telephone lines for allowing said communication;

a plurality of relay coils, with respective ones of said relay coils controlling respective pairs of said contacts to be opened or closed;

***549** a plurality of sets of non-locking pushbutton [switch means] switches with each set of pushbutton [switch means] switches connected to respective ones of said telephone stations with respective ones of said pushbutton [switch means] switches of said sets of pushbutton [switch means] switches corresponding to respective ones of said standard telephone lines and being connected with respective ones of said relay coils and being depressed for energizing a selected one of said relay coils for closing a corresponding pair of contacts to allow said telephone communication; [and]

an electronic holding circuit for each of said relay coils, said holding circuits being operative

to establish a held state after initial energization of the associated relay coil by momentarily depressing the associated pushbutton switch, and

to maintain said corresponding pair of contacts closed while in the held state;

a logic circuit for each station connected to said holding circuits to detect conditions for releasing the held state;

each of said stations comprising [first light display means] a set of status lights, connection means connecting corresponding pushbuttons of said sets of pushbutton [switch means] switches in each of said stations and to said [first light display means] status lights for energizing said [first light display means] status lights in each station to display the status of each of said plurality of standard telephone lines in each of said stations,

said station further comprising [first light display means] an active line indicator separate from said status lights connected to said pushbutton [switch means] switches for identifying the standard telephone line of said plurality of standard telephone lines that the telephone station is using for said

telephone communication.

Reissue claim 1 was held invalid on two grounds. The first ground was that it was substantially identical to claim 1 of the '282 patent, and thus invalid on the basis of collateral estoppel. The court in its 1982 decision referred to Carter U.S. Patent No. 3,150,238 and Foulkes U.S. Patent No. 3,757,056 as disclosing "non-locking buttons, relay coils and pairs of contacts" as applied to the original claim 1. In the 1984 decision the court stated that "Claim 1 has not been changed in such a way that alters the above finding of disclosure by prior art." 587 F.Supp. at 1499, 223 USPQ at 964. This treatment of the reissue claim is not supported by the claim content, as will be apparent from the court's further discussion of claim 1.

As the second ground for its holding of invalidity the court analyzed the changes made by reissue. The court identified three areas as new to reissue claim 1, and applied five references to these areas as follows: "See Defendants' Exhs. C13, D4-D6 (non-locking buttons); Defendants' Exhs. C4, C7 (holding circuits); Defendants' Exhs. C16, C13 (separate active lines)." Id. at 1499, 223 USPQ at 964 (footnotes omitted).

The first set of cited exhibits refers to articles by Keith, "A New Switching System for Right of Way Companies," Bell Laboratories Record, Apr. 1968, and Ozenberger, "Voice Communication System for Air Traffic Control," Bell Laboratories Record, May 1961, which the court stated taught the use of non-locking pushbuttons. The second set refers to the Carter patent, which the district court said teaches a "Relay Control Circuit" (the title of the Carter patent), and the Foulkes patent which "recites that [e]ach of these [control] circuits may take any desired and presently known form . . . to perform a recognized control function . . . evaluat[ing] the 'hold' feature' ". Id. at 1499 n.6, 223 USPQ at 946 n.6. The third set of exhibits refers to Simon U.S. Patent No. 3,928,732, which the district court described by its title, "Extension and Line Indicating Display System for Key Telephone System," and Keith, which the district court stated "also discloses separate active lines." Id. at 1499 n.7, 223 USPQ at 964 n.7.

The court's analysis of the scope of the new material in reissue claim 1 in itself shows the error in the court's conclusion that as a matter of law reissue claim 1 is substantially identical to its parent claim. The claim limitations of the electronic holding circuits for each relay coil, the logic circuit, and separate active line indicator, in combination with the non-locking

pushbutton switches connected to the relay coils, were added by reissue. Observing these differences, their relationship to the invention as a whole, and the prior art, we conclude as a matter of law that reissue claim 1 is not substantially identical to the original claim. The 1982 decision, which was directed to the original claims, does not apply to the reissue claims. Collateral estoppel as a basis for the court's holding of invalidity is not supported in law.

Having determined that a reissue claim is not substantially identical to the parent, the parent claim is of no further moment. As stated in *Wayne-Gossard Corp. v. Moretz Hosiery Mills, Inc.*, 539 F.2d 986, 991, 191 USPQ 543, 546-47 (4th Cir. 1976), "the original claim was at an end, denuded of all potency save as a bench mark of interpretation, at the time of the reissue's infringement."

***550** The original claim is not prior art against the reissue claim. It is not correct to weigh the reissue claim against the original claim. It is not correct to weigh the changes in the reissue claim against the original claim. It is the reissue claim alone that is to be analyzed in accordance with the Graham guidelines, and the differences to be considered are the differences between the reissue claim as a whole and the prior art.

In the court's 1982 analysis of the original claims, to which the court referred in its 1984 decision, the court had identified "six principal features which plaintiff argues are not obvious" and explained why the court concluded that these features are obvious by referring to various prior art references showing various of the features in various contexts. *Interconnect Planning Corp. v. Feil*, 543 F.Supp. at 617, 215 USPQ at 739. As we have observed, it is the emphasis on the obviousness of "features," rather than the claimed telephone system as a whole, that constitutes the flaw in the application of section 103 to the Feil claims. As stated in *In re Shuman*, 361 F.2d 1008, 1012, 150 USPQ 54, 57 (CCPA 1966):

It is impermissible to first ascertain factually what appellants did and then view the prior art in such a manner as to select from the random facts of that art only those which may be modified and then utilized to reconstruct appellants' invention from such prior art.

The court in 1982 summarized its conclusion with respect to these six "features" by observing (1) that although the pairs of contacts and relay coils "is not disclosed in either the Keith Article or the Ozenberger

Article", the Foulkes and Carter patents do disclose them; (2) that Keith, Ozenberger, and Foulkes refer to pushbutton switches; (3) that Keith shows a set of display lamps although Ozenberger uses a single lamp, and that Paraskevatos (U.S. Patent No. 3,727,003) and Simon et al. show either a digital display or the incoming line number; (4) that Paraskevatos shows a decoder and that "the diode matrix was no mystery to one engineer" (Thomas Fitzmaurice, of Bell Labs, who testified that he readily understood the Feil system after he was shown it); (5) that Keith shows which lines are active; and (6) that the asserted unique master station hook up with blocking means is shown in Ozenberger and a Verdon patent (U.S. Patent No. 3,819,871). *Interconnect Planning Corp. v. Feil*, 543 F.Supp. at 617-19, 215 USPQ at 739-40.

In its 1984 decision the court added the additional citations of references pertinent to the changes in the reissue claims, as discussed above. As in its citation of references against the various features of the original claims, the court selected from each reference a feature or features that also appeared in the reissue claims. No reference, however, suggested the overall arrangement, the "architecture", of the Feil system.

IPC presented affidavit testimony explaining the references in the context of the state of the telephone systems art at the time, none of which testimony was controverted other than by attorney argument. The most advanced multi-line devices at the time the invention was made, according to this record, used the then state-of-the-art crossbar switching equipment, and electrical or mechanical interconnections or interlocks. The two Bell Labs publications of Keith and Ozenberger, on which defendants and the district court placed substantial emphasis, used crossbar switching. Feil did not.

Mr. Feil's affidavit filed with the district court states "The Ozenberger and Keith articles disclose what I thought I invented in 1974". Mr. Feil made no reference to the crossbar switches required by these references, and offered no discussion of either differences or similarities between his system and those of these references.

The Carter patent used relay switches in the telephone switching system it describes. Carter, of Bell Laboratories, taught the use of quick-release control relays in combination with slow-release work relays, to achieve the specific purposes desired by Carter. Carter also required use of a "locking chain" rather than independently operating relays, and a more complex

communication path as compared with Feil's direct connections. Feil established multiple direct connections in a system where theretofore it was believed, according to the record, that crossbar switches would be required.

The Feil system eliminated both crossbar switches and mechanical interlocks or mechanically locking pushbuttons, and instead used relays, a well-known type of switch. But Feil avoided the need (of Carter) to establish potentially large numbers of contacts and operates a concomitantly large number of relays in series in order to connect stations within the system. As IPC's uncontroverted testimony shows, Feil avoided interconnections and interlocks, both of which, according to the Maywald affidavit, had previously been considered necessary to lock out faults. The Maywald affidavit stated that Carter's approach would be "impossible and impractical" in the trader turret application because "[t]o try and accurately control the release times of different relays over a long period of time would be virtually impossible considering the wear and deterioration of components" in a "trader turret network involving some 20,000 or more relays". Maywald's explanation of the *551 technical operation of the references is uncontradicted, although defendants take issue in attorney argument with Maywald's conclusions.

The Foulkes patent, on which the district court also relies, described a "bipolar multiplexing circuit" based on a "contact tree" relay switching arrangement. Foulkes taught a telephone system that Maywald avers, without contradiction, "could not be realistically expanded into large systems like trader turrets". The district court did not explain how the Foulkes or other systems of different circuitry made obvious the different system of Feil's claims.

The Keith and Ozenberger systems, as previously discussed, are different systems from that of Feil. Like the systems of the other references, they contain some elements in common with that of Feil. the Ozenberger system, based on crossbar switches, was designed for air traffic control. The Keith system is described as tailored to the specific needs of "right-of-way" companies, and is a cordless system limited to up to eight consoles of up to a hundred lines. As Keith says, "[a] system of crossbar switches is the heart of the switching system". Neither Keith nor Ozenberger suggests that the crossbars be replaced with relays and that the other changes be made to produce the admittedly different Feil system.

The novelty of the Feil system is not controverted by the defendants. Its value in trader turret systems has received the ultimate recognition, market success and imitation.

35 U.S.C. § 103 requires that obviousness be determined with respect to the invention as a whole. See, e.g., *Jones v. Hardy*, 727 F.2d 1524, 1528, 220 USPQ 1021, 1024 (Fed. Cir. 1984); *W.L. Gore & Assocs, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983), cert. denied, 105 S.Ct. 172 (1984); *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1537, 218 USPQ 871, 877 (Fed. Cir. 1983). This is essential for combination inventions, for generally all combinations are of known elements. *Environmental Designs, Ltd. v. Union Oil Co. of California*, 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983), cert. denied, 104 S.Ct. 709, 224 USPQ 520 (1984).

When prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577 & n.14, 221 USPQ 929, 933 & n.14 (Fed. Cir. 1984). There must be "something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination". *Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984).

Critical to the analysis is an understanding of the particular results achieved by the new combination. The claims here at issue are directed to a combination of known components of telephone systems in an admittedly new way to achieve a new total system. Neither the district court in its opinion, nor he defendants, identified any suggestion in the prior art that the components be combined as they were by Feil or that such combination could achieve the advantages of the Feil system.

Not only must the claimed invention as a whole be evaluated, but so also must the references as a whole, so that their teachings are applied in the context of their significance to a technician at the time -- a technician without our knowledge of the solution. The defendants propounded and the district court appears to have followed an analytical method that well illustrates the "mosaic" analogy discussed in *W.L. Gore & Assocs.*, 721 F.2d at 1552, 220 USPQ at 3312, where this court said:

[T]he claims were used as a frame, and individual naked parts of separate prior art references were employed as a mosaic to recreate a facsimile of the claimed invention.

Defendants refer to the decision of the Supreme Court in *Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 189 USPQ 449 (1976). As the Court there held, Sakraida's combination of old elements to wash barn floors with flowing water did not produce a new or different function, and affirmed the district court's holding that " 'all of the elements of [the combination] are old . . . and the combination of them . . . being neither new nor meeting the test of non- obviousness.' " *Id.* at 274, 189 USPQ at 450. In the Feil invention the combination was admittedly new, and it produced a new system having theretofore unavailable attributes.

Recognizing the difficulty of casting one's mind back to the state of technology at the time the invention was made, courts have long recognized the usefulness of evidence of the contemporaneous attitude toward the asserted invention. A retrospective view of the invention is best gleaned from those who were there at the time. Mr. Feil, the inventory impugning his own invention, now avers that he did no more than did the prior art, specifically the Keith and Ozenberger articles. Mr. Feil's disavowal of his invention is staunch, although he less modestly commented in 1977, before he left IPC, on the reaction of Bell Labs' engineer at that earlier time:

He [Fitzmaurice] showed too much enthusiasm. I mean, he was really excited by the *552 thing. Like this is incredible. You guys are geniuses.

You're 50 miles ahead of Bell Labs. (App. Vol. VI, F357).

You know what he said. He said You're 50 miles ahead of Bell Lab? He said "miles", not years, he made it in miles. You're 50' miles ahead of the Bell Labs. (App. Vol. VI, F355).

Mr. Elia of the Republic Bank, one of IPC's customers, attested:

Upon viewing the equipment, the AT&T people indicated that it was unbelievable. They did not think it could be done. They were surprised that it was done. (App. Vol. VI, F360).

Although the district court remarked in its 1982

decision that evidence of commercial success "cannot be afforded any weight" "in light of my finding of obviousness", 543 F.2d at 619, 215 USPQ at 741, such evidence when present must be considered and afforded appropriate weight. *Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 739 F.2d 1573, 1575, 222 USPQ 744, 746 (Fed. Cir. 1984), cert. denied, 105 S.Ct. 2138 (1985); *Jones v. Hardy*, 727 F.2d at 1530, 220 USPQ at 1026; *Medtronic, Inc. v. Cardiac Pacemakers, Inc.*, 721 F.2d 1563, 1575, 220 USPQ 97, 105 (Fed. Cir. 1983); *Stratoflex, Inc.*, 713 F.2d at 1538-39, 218 USPQ at 879; *In re Sernaker*, 702 F.2d 989, 996, 217 USPQ 1, 7 (Fed. Cir. 1983); *In re Mageli*, 470 F.2d 1380, 1383, 176 USPQ 305, 307 (CCPA 1973). IPC offered affidavit and deposition evidence, by two experts in telephone systems and by a Bell system engineer knowledgeable in the field of trader turrets. Their uncontroverted testimony was to the effect that the Feil system was perceived at the time as an exceptional technological achievement.

The requirement that "secondary considerations" be considered in determinations under section 103 aids in evaluating the state of the art at the time the invention was made. *In re Piasecki*, 745 F.2d 1468, 1475, 223 USPQ 785, 790 (Fed. Cir. 1984). It is not pertinent that the invention was easily understood after it was made -- a factor that appears to have been considered significant by the district court, see 543 F.Supp. at 619, 215 USPQ at 741 -- but whether it would have been obvious to make the invention at the time. Giving due weight to the market success and contemporaneous reaction to the Feil trader turret system, the record does not contain clear and convincing evidence that the Feil invention of the reissue claims would have been obvious to one of ordinary skill in this art at the time the invention was made.

Reissue claims 2-9 are either dependent on reissue claim 1, include similar limitations, or include additional limitations. Although each claim has been considered separately, they need not here be treated in redundant detail. For each claim we are compelled to

the conclusion that the burden of proving invalidity by clear and convincing evidence has not been met.

The summary judgment of invalidity of Reissue Patent No. 31,144, in terms of 35 U.S.C. § 103, is vacated, as is the dismissal of the infringement claim. The case is remanded to the district court for further proceedings consistent herewith.

VACATED and REMANDED.

FN1 The complaint against Robert O. Carpenter and Turret Equipment Corp. was dismissed by stipulation, and they are not parties to this appeal.

FN1 IPC Communications, Ltd. v. Standard Teleservices Supply, Inc., No. 81-1832D (D.N.J. 1984) (unreported), vacated and remanded, No. 84-1599 (Fed. Cir. -----, 1985) (unreported).

FN2 *In South Corp. v. United States*, 690 F.2d 1368, 215 USPQ 657 (Fed. Cir. 1982), the Federal Circuit adopted as precedent the decisions of the Court of Claims and the Court of Customs and Patent Appeals.

FN3 IPC argues that the district court should not have resolved any question of substantial identity between the claims of the original and reissue patents in defendants' favor because that is a contested fact question which should not have been resolved against the nonmovant, citing *Tee-Pak, Inc. v. St. Regis Paper Co.*, 491 F.2d 1193, 1200, 181 USPQ 75, 80 (6th Cir. 1974). Under this court's precedent substantial identity between claims, a matter of claim interpretation, is a question of law. See, e.g., *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 956, 220 USPQ 592, 596 (Fed. Cir. 1983), cert. denied, 105 S.Ct. 127, 225 USPQ 232 (1984).

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227 U.S.P.Q. 543

END OF DOCUMENT

Appendix 4:

W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir.
1983)

▽

W.L. Gore & Associates, Inc.

. v.

Garlock, Inc.

Court of Appeals, Federal Circuit

Nos. 83-613/614

Decided Nov. 14, 1983

United States Patents Quarterly Headnotes

PATENTS

[1] Court of Appeals for the Federal Circuit -- Weight given decision reviewed (§ 26.59)

Parties' argument relating to salutary injunction of FRCivP 52(a) cannot be controlling on all issues, where dispositive legal error occurred in interpretation and application of patent statute, 35 USC.

PATENTS

[2] Court of Appeals for the Federal Circuit -- Weight given decision reviewed (§ 26.59)

Findings that rest on erroneous view of law may be set aside on that basis.

PATENTS

[3] Construction of specification and claims -- Claim defines invention (§ 22.30)

Claims measure and define invention.

PATENTS

[4] Construction of specification and claims -- Combination claims (§ 22.35)

Infringement -- Process patents (§ 39.65)

Court's restriction of claimed multi-step process to one step constitutes error, whether done at behest of patentee relying on that restriction to establish infringement by one who employs only that one step in process otherwise distinct, or at behest of accused infringer relying on that restriction to establish invalidity by showing that one step in prior art process otherwise distinct; invention must be considered as whole.

PATENTS

[5] Court of Appeals for the Federal Circuit -- Weight given decision reviewed (§ 26.59)

CAFC is not at liberty to substitute its own for district court's findings underlying district court's conclusion that claim is invalid.

PATENTS

[6] Patentability -- Anticipation -- Process (§ 51.225)

It is irrelevant that those using invention may not have appreciated results where patent owner's operation of device is consistent, reproducible use of claimed invention; were that alone enough to prevent anticipation, it would be possible to obtain patent for old and unchanged process.

PATENTS

[7] Use and sale -- Extent and character of use (§ 69.5)

Nonsecret use of claimed process in usual course of producing articles for commercial purposes is public use.

PATENTS

[8] Use and sale -- Extent and character of use (§ 69.5)

Patentees' commercialization of product produced by its patented process can result in forfeiture of patent granted them for that process on application filed by them more than one year later; however, third party secret commercialization of process cannot be bar to patent grant on that process.

PATENTS

[9] Patent grant -- Intent of patent laws (§ 50.15)

Early public disclosure is linchpin of patent system.

PATENTS

[10] Interference -- Priority (§ 41.70)

Law disfavors prior inventor who benefits from process by selling its product but suppresses, conceals, or otherwise keeps process from public, as against later inventor who promptly files patent application from which public will gain disclosure of process.

PATENTS

[11] Patentability -- Evidence of -- In general (§ 51.451)

District court that in its consideration of prior art disregarded unpredictability and unique nature of product to which claimed inventions relate errs.

PATENTS

[12] Construction of specification and claims -- By prior art (§ 22.20)

District court that in its consideration of prior art considers claims in less than their entireties errs.

PATENTS

[13] Patentability -- Evidence of -- Suggestions of prior art (§ 51.469)

District court that considers references in less than their entirety, i.e., in disregarding disclosures in references that diverge from and teach away from invention at hand, errs.

PATENTS

[14] Construction of specification and claims -- Comparison with other claims (§ 22.40)

Claims must be considered individually and separately.

PATENTS

[15] Patentability -- Anticipation -- Combining references (§ 51.205)

There must have been something present in teachings in references to suggest to one skilled in art that claimed invention before court would have been obvious.

PATENTS

[16] Patentability -- Evidence of -- Suggestions of prior art (§ 51.469)

Fact that patentee proceeded contrary to accepted wisdom of prior art is strong evidence of nonobviousness.

PATENTS

[17] Patentability -- Tests of -- Skill of art (§ 51.707)

Imbuing one of ordinary skill in art with knowledge of invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to insidious effect of hindsight syndrome wherein that which only inventor taught is used against its teacher.

PATENTS

[18] Patentability -- Invention -- In general (§ 51.501)
Patentability -- Tests of -- Skill of art (§ 51.707)

Decisionmaker must forget what he or she has been taught at trial about claimed invention and cast mind back to time invention was made to occupy mind of one skilled in art who is presented only with references, and who is normally guided by then-accepted wisdom in art.

PATENTS

[19] Pleading and practice in courts -- Burden of proof -- Validity (§ 53.138)

Presumption for patent grant -- Patent Office consideration of prior art (§ 55.5)

It is not law that presumption of validity is weakened greatly where Patent Office has failed to consider pertinent prior art; presumption has no separate evidentiary value; it cautions decisionmaker against

rush to conclude invalidity; submission of additional art that is merely "pertinent" does not dispel that caution; however, inescapable burden of persuasion on one who would prove invalidity remains throughout trial.

PATENTS

[20] Pleading and practice in courts -- Burden of proof -- Validity (§ 53.138)

Presumption from patent grant -- Patent Office consideration of prior art (§ 55.5)

Burden of proving invalidity may be facilitated by prior art that is more pertinent than that considered by PTO.

PATENTS

[21] Patentability -- Evidence of -- In general (§ 51.451)

District court that specifically declines to consider objective evidence of nonobviousness errs; that evidence can often serve as insurance against insidious attraction of siren hindsight when confronted with difficult task of evaluating prior art; even when prior art evidence points more in direction of nonobviousness than obviousness, objective evidence may tend to reassure decisionmaker.

PATENTS

[22] Patentability -- Anticipation -- In general (§ 51.201)

Anticipation requires disclosure in single prior art reference of each element of claim under consideration.

PATENTS

[23] Patentability -- Anticipation -- Process (§ 51.225)
Patentability -- Composition of matter (§ 51.30)

Anticipation of inventions set forth in product claims cannot be predicated on mere conjecture respecting characteristics of products that might result from practice of processes disclosed in references.

PATENTS

[24] Patentability -- Anticipation -- Infringement as test (§ 51.211)

Accused infringer's employment of process of dominating patent is not anticipation of invention described and claimed in improvement patent.

PATENTS

[25] Patentability -- Anticipation -- In general (§ 51.201)

Patentability -- Invention -- In general (§ 51.501)

Inherency and obviousness are distinct concepts.

PATENTS

[26] Patentability -- Evidence of -- In general (§ 51.451)

All evidence bearing on obviousness issue, as with any other issue raised in conduct of judicial process, must be considered and evaluated before required legal conclusion is reached.

PATENTS

[27] Patentability -- Evidence of -- In general (§ 51.451)

Objective evidence of nonobviousness, i.e., "indicia" of *Graham v. John Deere Co.*, 148 USPQ 459, may in given case be entitled to more weight or less, depending on its nature and its relationship to invention's merits; it may be most pertinent, probative, and revealing evidence available to aid in reaching conclusion on obvious/nonobvious issue.

PATENTS

[28] Patentability -- Evidence of -- Commercial success -- In general (§ 51.4551)

Praise greeting products claimed in patent from suppliers, including owner of prior art patent, is objective evidence of nonobviousness.

PATENTS

[29] Patentability -- Composition of matter (§ 51.30)

Claim to new product is not required to include critical limitations.

PATENTS

[30] Specification -- Sufficiency of disclosure (§ 62.7)

Patents are written to enable those skilled in art to practice invention, not public, and Section 112 speaks as of application filing date, not as of time of trial.

PATENTS

[31] Specification -- Sufficiency of disclosure (§ 62.7)

Section 112 requires that inventor set forth best mode of practicing invention known to him at time application was filed.

PATENTS

[32] Claims -- Indefinite -- In general (§ 20.551)

Use of "stretching at rate exceeding specific percent per second" in claims is not indefinite.

PATENTS

[33] Claims -- Specification must support (§ 20.85)

It is claimed invention for which enablement is required.

PATENTS

[34] Specification -- Sufficiency of disclosure (§ 62.7)

Patent is not invalid merely because some experimentation is needed; patent is invalid only when those skilled in art are required to engage in undue experimentation to practice invention.

PATENTS

[35] Construction of specification and claims -- Claim defines invention (§ 22.30)

Distinguishing what infringes from what does not is role of claims, not of specification.

PATENTS

[36] Construction of specification and claims -- Defining terms (§ 22.45)

Patent applicant can be his own lexicographer.

PATENTS

[37] Defenses -- Fraud (§ 30.05)

Fraud must be shown by clear and convincing evidence; state of mind of one making representations is most important of elements to be considered in determining existence of fraud; good faith and subjective intent, while they are to be considered, should not necessarily be made controlling; under ordinary circumstances, fact of misrepresentation coupled with proof that party making it had knowledge of its falsity is enough to warrant drawing inference that there was fraudulent intent; where public policy demands complete and accurate disclosure it may suffice to show nothing more than that misrepresentations were made in atmosphere of gross negligence as to their truth.

PATENTS

[38] Pleading and practice in courts -- Issues determined -- Validity and infringement (§ 53.505)

Better practice is for district court to decide both validity and infringement issues when both are contested at trial, enabling conduct of single appeal and disposition of entire case in single appellate opinion.

PATENTS

[39] Infringement -- Tests of -- Comparison with claim (§ 39.803)

Infringement is decided with respect to each asserted claim as separate entity.

PATENTS

Particular patents -- Porous Products

3,953,566, *Gore*, Process for Producing Porous Products, holding of invalidity of claims 3 and 19 reversed and of claims 1 and 17 affirmed.

4,187,390, Gore, Porous Products and Process Therefor, holding of invalidity reversed.

***306** Appeal from District Court for the Northern District of Ohio, Manos, J.; 220 USPQ 220.

Consolidated actions by W. L. Gore & Associates, Inc., against Garlock, Inc., for patent infringement, in which defendant counterclaims for declaratory judgment of patent invalidity, noninfringement, fraudulent solicitation, and entitlement to attorney fees. From judgment for defendant, plaintiff appeals and defendant cross-appeals. Affirmed in part, reversed in part, and remanded; Davis, Circuit Judge, concurring in result in part and dissenting in part, with opinion.

David H. Pfeffer, New York, N.Y. (J. Robert Dailey and Janet Dore, both of New York, N.Y., and John S. Campbell, Newark, Del., of counsel) for appellant.

John J. Mackiewicz, Philadelphia, Pa. (Dale M. Heist, Philadelphia, Pa., on the brief, Bernard Ouziel, New York, N.Y., of counsel) for appellee.

Before Markey, Chief Judge, and Davis and Miller, Circuit Judges.

Markey, Chief Judge.

Appeal from a judgment of the District Court for the Northern District of Ohio holding U.S. Patents 3,953,566 ('566) and 4,187,390 ('390) invalid. We affirm in part, reverse in part, and remand for a determination of the infringement issue.

Background

Tape of unsintered polytetrafluorethylene (PTFE) (known by the trademark TEFLON of E.I. du Pont de Nemours, Inc.) had been stretched in small increments. W. L. Gore & Associates, Inc. (Gore), assignee of the patents in suit, experienced a tape breakage problem in the operation of its "401" tape stretching machine. Dr. Robert Gore, Vice President of Gore, developed the invention disclosed and claimed in the '566 and '390 patents in the course of his effort to solve that problem. The 401 machine was disclosed and claimed in Gore's U.S. Patent 3,664,915 ('915) and was the invention of Wilbert L. Gore, Dr. Gore's father. PTFE tape had been sold as thread seal tape, i.e., tape used to keep pipe joints from leaking. The '915 patent, the application for which was filed on October 3, 1969, makes no reference to stretch rate, at 10% per second or otherwise, or to matrix tensile strength in excess of

7,300 psi.

Dr. Gore experimented with heating and stretching of highly crystalline PTFE rods. Despite slow, careful stretching, the rods broke when stretched a relatively small amount. Conventional wisdom in the art taught that breakage could be avoided only by slowing the stretch rate or by decreasing the crystallinity. In late October 1969, Dr. Gore discovered, contrary to that teaching, that stretching the rods as fast as possible enabled him to stretch them to more than ten times their original length with no breakage. Further, though the rod was thus greatly lengthened, its diameter remained virtually unchanged throughout its length. The rapid stretching also transformed the hard, shiny rods into rods of a soft, flexible material.

Gore developed several PTFE products by rapidly stretching highly crystalline PTFE, including: (1) porous film for filters and laminates; (2) fabric laminates of PTFE film bonded to fabric to produce a remarkable material having the contradictory properties of impermeability to liquid water and permeability to water vapor, the material being used to make "breathable" rainwear and filters; (3) porous yarn for weaving and braiding into other products, like space suits and pump packing; (4) tubes used as replacements for human arteries and veins; and (5) insulation for high performance electric cables.

***307** On May 21, 1970, Gore filed the patent application that resulted in the patents in suit. The '566 patent has 24 claims directed to processes for stretching highly crystalline, unsintered, PTFE. The processes, inter alia, include the steps of stretching PTFE at a rate above 10% per second and at a temperature between about 35 degreesC and the crystalline melt point of PTFE. The '390 patent has 77 claims directed to various products obtained by processes of the '566 patent.

It is effectively undisputed that the present inventions filled a long sought yet unfilled need. The United States Army and the research director of a Garlock Inc. (Garlock) customer had been looking for and following up every remote lead to a waterproof/breathable material for many years.

It is undisputed that the present inventions enjoyed prompt and remarkable commercial success due to their merits and not to advertising or other extraneous causes.

It is undisputed that the inventions provide the most

important synthetic material available for use in vascular surgery, hundreds of thousands of persons having received artificial arteries formed of the patented products since 1976, and that the patented products have unique properties useful in other medical procedures, in communications satellites, radar systems, and electrical applications.

It is undisputed that the major sources of PTFE, ICI and du Pont, greeted the patented products as "magical," "bewitching," "a remarkable new material," and one that "differs from other processed forms of Teflon."

It is undisputed that the patented products were met with skepticism and disbelief by at least one scientist who had worked with PTFE at du Pont for many years and who testified as an expert at trial.

It is undisputed that Garlock first produced an accused product in response to a customer's request for a substitute for the patented product, that Garlock

'566 patent claims	'390 patent claims	Garlock Product
19	14, 43	film
--	36, 77	laminate
19	18	yarn
--	67	braided packing
3	--	tape

At trial, Garlock addressed only claims 1, 3, 17, and 19 of the '566 patent and claims 1, 9, 12, 14, 18, 35, 36, 43, 67 and 77 of the '390 patent. See Appendix to this opinion.

The district court, in a thorough memorandum accompanying its judgment, and in respect of the '566 patent: (1) found claim 1 anticipated under 35 U.S.C. § 102(a) by Gore's use of its 401 machine and use by the Budd Company (Budd) of a Cropper machine; (2) declared all claims of the patent invalid under 102(b) because the invention had been in public use and on sale more than one year before Gore's patent application, as evidenced by Budd's use of the Cropper machine; (3) held claims 1, 3, 17 and 19 invalid for obviousness under 35 U.S.C. § 103, on the basis of various reference pairings: (a) Japanese patent 13560/67 (Sumitomo) with U.S. patent 3,214,503 (Markwood); (b) U.S. patent 2,776,465 (Smith) with Markwood; or (c) Gore's '915 patent with Sumitomo;

advertised its accused product as a "new form" of PTFE and as "a versatile new material which provides new orders of performance for consumer, industrial, medical and electrical applications," and that the customer describes that accused product as "a new dimension in rainproof/breathable fabrics."

Proceedings

On Nov. 2, 1979, Gore sued Garlock for infringement of process claims 3 and 19 of the '566 patent, and sought injunctive relief, damages and attorney fees. Garlock counterclaimed on Dec. 18, 1979, for a declaratory judgment of patent invalidity, non-infringement, fraudulent solicitation, and entitlement to attorney fees. On Feb. 7, 1980, Gore filed a second suit for infringement of product claims 14, 18, 36, 43, 67 and 77 of the '390 patent. In light of a stipulation, the district court consolidated the two suits for trial.

Gore alleged infringement of certain claims by certain products:

and (4) held all claims invalid as indefinite under 35 U.S.C. § 112. [FN1]

***308** In its opinion respecting the '390 patent, the district court held: (1) claims 1, 9, 12, 14, 18, 35, 36, 43, 67 and 77 invalid §§102 and 103 in view of Sumitomo and Smith; and (2) all claims invalid as indefinite under § 112.

The court found that Gore did not commit fraud before the Patent and Trademark Office (PTO), denied Garlock's request for attorney fees, and refrained from deciding the infringement issue.

Issues

Did the district court err in: (1) its holding of invalidity under §§102(a), 102(b), 103 and 112; (2) its finding that Gore did not commit fraud on the PTO; or (3) denying attorney fees.

Opinion

This hard fought and bitterly contested case involved over two years of discovery, five weeks of trial, the testimony of 35 witnesses (19 live, 16 by deposition), and over 300 exhibits. The district court issued an exhaustive 37- page memorandum opinion reflective of a careful, conscientious approach to the determination of the many issues presented at trial.

The record on appeal consists of 2000 pages. The parties' briefs total 199 pages. In those briefs, counsel repeatedly accuse each other of numerous and serious breaches of the duty of candor owed the court. Each cites instances in which the testimony, the findings, and the record are or are said to be quoted in part and out of context. As a result, the usefulness and reliability of the briefs as means of informing the court has been greatly diminished if not destroyed, and careful, time-consuming study of all exhibits and each page of the record has been required.

Appellant cited 80 prior court opinions in its main brief. Appellee's brief totally ignores all but two of those citations, but adds 57 more. Appellant's reply brief cites 126 prior court opinions, 34 earlier cited, 67 newly cited, and 25 of those cited by appellee. Appellee's reply brief cites 17 prior court opinions, 4 earlier cited, 7 newly cited, and 6 of the 147 cited by appellant. Accordingly, 211 prior court opinions have been evaluated in relation to the proof found in the record.

In light of the entire record and the applicable law, we are convinced that Garlock failed to carry its burden of proving all claims of the present patents invalid.

Standard of Review

[1][2] Where, as here, dispositive legal error occurred in interpretation and application of the patent statute, 35 U.S.C., the parties' arguments relating to the salutary injunction of Fed.RuleCiv.P. 52(a) cannot be controlling on all issues. Findings that "rest on an erroneous view of the law may be set aside on that basis," *Pullman-Standard v. Swint*, 456 U.S. 273 (1982). Thus it is unnecessary here to set aside any probative fact found by the district court on the basis of its being clearly erroneous, or to engage in what would be an inappropriate reweighing of the facts.

Among the legal errors extant in the record, each of which is discussed below, are (1) the invention set forth in each claim was not in each instance considered

as a whole; (2) 35 U.S.C. §102(b) was applied though criteria for its application were not present; (3) the references were not assessed in their entirety; (4) an inherency theory under §§102 and 103 was inappropriately applied; (5) that which only the inventor taught was attributed to the prior art; (6) individual steps in prior art processes dealing with materials distinct from those with which the present inventions dealt were erroneously equated to steps in the claimed processes; (7) objective evidence of nonobviousness was disregarded; and (8) the function and application of §112 were misconstrued.

Because it permeated so much of the district court's analysis, we note more fully its frequent restriction of its consideration to 10% per second rate of stretching, which it called the "thrust of the invention." That approach is repeated throughout Garlock's briefs, which refer repeatedly to the "thrust of the invention," to "the inventive concept," and to the claims "shorn of their extraneous limitations." That facile focusing on the "thrust," "concept," and "shorn" claims, resulted in treating the claims at many points as though they read differently from those actually allowed and in suit.

[3] *309 It is true that Dr. Gore emphasized rapid stretching, for example, as well as the amount of stretch and other process limitations, during prosecution of the application for the '566 patent. Yet it is the claims that measure and define the invention. *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 339, 128 USPQ 354 (1961); *Bowser, Inc. v. U.S.*, 388 F.2d 346, 349, 156 USPQ 406, 409 (Ct. Cl. 1967).

[4] Each claimed invention must be considered as a whole. 35 U.S.C. § 103; *Schenck, A.G. v. Nortron Corp.*, 218 USPQ 698, 700 (Fed. Cir. 1983). In determining obviousness, there is "no legally recognizable or protected 'essential,' 'gist,' or 'heart' of the invention." *Aro*, 365 U.S. at 345. A court's restriction of a claimed multi-step process to one step constitutes error, whether done at the behest of a patentee relying on that restriction to establish infringement by one who employs only that one step in a process otherwise distinct, or at the behest of an accused infringer relying on that restriction to establish invalidity by showing that one step in a prior art process otherwise distinct.

(1) Invalidity

(a) '566 Patent

(i) §102(a) and The 401 Machine

It is undisputed that the district court held only claim 1 of the '566 patent to have been anticipated under § 102(a) by operation of the 401 machine in the Gore shop before Dr. Gore's invention in late October 1969. It did so on the deposition testimony of two former Gore employees, documents, and drawings of the 401 machine.

In August 1969, Gore offered to sell to Export Tool Company (Export) tape "to be made" on the 401 machine. Tape made on the 401 machine was shipped to Export on October 24, 1969. The trial judge found the rolls on the 401 machine were, at least at some point in time before October 1969, spaced less than four feet apart and that the rate of stretch accomplished in operating that machine (admittedly operated in accord with the description of machine operation in the '915 patent) must have been greater than 10% per second. The district court credited testimony that Teflon 6-c, a highly crystalline form of Teflon, was used because it was the standard resin at the time, and that the tape was stretched at a temperature above 35 degreesC. Thus it cannot be said that the record fails to support the district court's finding that the limitations of claim 1 were met by Gore's operation of the 401 machine before Dr. Gore's asserted "late October 1969" date of invention. Though he was working with the operation of the 401 machine, Dr. Gore offered no proof that his invention date was before the date of shipment to Export.

[5] Gore, seeking a review here of the evidence, points to certain inadequacies as indicating a failure to meet the required clear and convincing standard under §102(a). At the time of trial, the district court, bound by precedent then applicable, applied a preponderance of the evidence test. Gord asserts, erroneously, that the clearly erroneous standard does not therefore apply on this appeal. Gore does not, however, point to any basis on which the district court's findings must be held to have been clearly erroneous under the clear and convincing standard. We are not at liberty, of course, to substitute our own for the district court's findings underlying its conclusion that claim 1 is invalid.

[6] Gore's operation of the 401 machine must thus be viewed as a consistent, reproducible use of Dr. Gore's invention as set forth in claim 1, and it is therefore irrelevant that those using the invention may not have appreciated the results. *General Electric Co. v. Jewel Incandescent Lamp Co.*, 326

U.S. 242, 248, 67 USPQ 155, 157-58 (1945). Were that alone enough to prevent anticipation, it would be possible to obtain a patent for an old and unchanged process. *Ansonia Brass & Copper Co. v. Electric Supply Co.*, 144 U.S. 11, 18 (1892); see, *H.K. Regar & Sons, Inc. v. Scott & Williams, Inc.*, 63 F.2d 229, 231, 17 USPQ 81, 83 (2d Cir. 1933).

[7] The nonsecret use of a claimed process in the usual course of producing articles for commercial purposes is a public use. *Electric Storage Battery Co. v. Shimadzu*, 307 U.S. 5, 20, 41 USPQ 155, 161 (1939), and there was no evidence that any different process was used to produce the articles shipped to Export.

Thus it cannot be said that the district court erred in determining that the invention set forth in claim 1 of '566 patent was known or used by others under §102(a), as evidenced by Gore's operation of the 401 machine before Dr. Gore's asserted date of that invention.

In view of our affirmance of the judgment reached on claim 1 under 102(a), we need not discuss other asserted grounds of invalidity of claim 1. There was, however, no evidence whatever that the inventions set forth in other claims, of either the '566 or the '390 patent, were known or used by others as a result of Gore's operation of the 401 machine before late October 1969.

***310 (ii) §102(b) and the Cropper Machine**

In 1966 John W. Cropper (Cropper) of New Zealand developed and constructed a machine for producing stretched and unstretched PTFE thread seal tape. In 1967, Cropper sent a letter to a company in Massachusetts, offering to sell his machine, describing its operation, and enclosing a photo. Nothing came of that letter. There is no evidence and no finding that the present inventions thereby became known or used in this country.

In 1968, Cropper sold his machine to Budd, which at some point thereafter used it to produce and sell PTFE thread seal tape. The sales agreement between Cropper and Budd provided:

**ARTICLE "E" - PROTECTION OF TRADE
SECRETS Etc.**

1. BUDD agrees that while this agreement is in force it will not reproduce any copies of the said apparatus without the express written permission of Cropper nor will it divulge to any person or

persons other than its own employees or employees of its affiliated corporations any of the said known-how or any details whatsoever relating to the apparatus.

2. BUDD agrees to take all proper steps to ensure that its employees observe the terms of Article "E" 1 and further agrees that whenever it is proper to do so it will take legal action in a Court of competent jurisdiction to enforce any one or more of the legal or equitable remedies available to a trade secret plaintiff.

Budd told its employees the Cropper machine was confidential and required them to sign confidentiality agreements. Budd otherwise treated the Cropper machine like its other manufacturing equipment.

A former Budd employee said Budd made no effort to keep the secret. That Budd did not keep the machine hidden from employees legally bound to keep their knowledge confidential does not evidence a failure to maintain the secret. Similarly, that du Pont employees were shown the machine to see if they could help increase its speed does not itself establish a breach of the secrecy agreement. There is no evidence of when that viewing occurred. There is no evidence that a viewer of the machine could thereby learn anything of which process, among all possible processes, the machine is being used to practice. As Cropper testified, looking at the machine in operation does not reveal whether it is stretching, and if so, at what speed. Nor does looking disclose whether the crystallinity and temperature elements of the invention set forth in the claims are involved. There is no evidence that Budd's secret use of the Cropper machine made knowledge of the claimed process accessible to the public.

The district court held all claims of the '566 patent invalid under 102(b), supra, note 3, because "the invention" was "in public use [and] on sale" by Budd more than one year before Gore's application for patent. Beyond a failure to consider each of the claims independently, 35 U.S.C. §282; *Altoona Publix Theatres, Inc. v. American Tri-Ergon Corp.*, 294 U.S. 477, 487, 24 USPQ 308 (1935), and a failure of proof that the claimed inventions as a whole were practiced by Budd before the critical May 21, 1969 date, it was error to hold that Budd's activity with the Cropper machine, as above indicated, was a "public" use of the processes claimed in the '566 patent, that activity having been secret, not public.

Assuming, arguendo, that Budd sold tape produced

on the Cropper machine before October 1969, and that that tape was made by a process set forth in a claim of the '566 patent, the issue under §102(b) is whether that sale would defeat Dr. Gore's right to a patent on the process inventions set forth in the claims.

[8] If Budd offered and sold anything, it was only tape, not whatever process was used in producing it. Neither party contends, and there was no evidence, that the public could learn the claimed process by examining the tape. If Budd and Cropper commercialized the tape, that could result in a forfeiture of a patent granted them for their process on an application filed by them more than a year later. *D.L. Auld Co. v. Chroma Graphics Corp.*, No. 83-585, slip op. at 5-6 (Fed. Cir. Aug. 15, 1983); See *Metalizing Engineering Co. v. Kenyon Bearing & Auto Parts Co.*, 153 F.2d 516, 68 USPQ 54 (2d Cir. 1946). There is no reason or statutory basis, however, on which Budd's and Cropper's secret commercialization of a process, if established, could be held a bar to the grant of a patent to Gore on that process.

[9][10] Early public disclosure is a linchpin of the patent system. As between a prior inventor who benefits from a process by selling its product but suppresses, conceals, or otherwise keeps the process from the public, and a later inventor who promptly files a patent application from which the public will gain a disclosure of the process, the law favors the latter. See *Horwath v. Lee*, 564 F.2d 948, 195 USPQ 701 (CCPA 1977). The district court therefore erred as a matter of law in applying the statute and in its determination that Budd's secret use of the Cropper machine and sale of tape rendered all process *311 claims of the '566 patent invalid under §102(b).

(iii) §103

In considering claims 1, 3, 17, and 19 of the '566 patent, the district court recognized that analysis of the obviousness issue under §103 requires determination of the scope and content of the prior art, the differences between the prior art, and the claims at issue, and the level of ordinary skill in the pertinent art. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966).

[11][12][13] In its consideration of the prior art, however, the district court erred in not taking into account the import of the markedly different behavior of PTFE from that of conventional thermoplastic polymers clearly established and

undisputed on the record, and in thus disregarding the unpredictability and unique nature of the unsintered PTFE to which the claimed inventions relate, *In re Whiton*, 420 F.2d 1082, 164 USPQ 455 (CCPA 1970); in considering claims in less than their entireties, *Schenck*, supra; and in considering the references in less than their entireties, i.e., in disregarding disclosures in the references that diverge from and teach away from the invention at hand. *In re Kuderna*, 426 F.2d 385, 165 USPQ 575 (CCPA 1970).

Invalidity of claim 1 under §102(a) having been determined, it is unnecessary to discuss in detail the applicability of §103 to that claim. If claim 1 had not been held anticipated under §102(a) in light of operation of the 401 machine, it is clear from the discussion here that claim 1 could not properly have been held invalid under §103.

Claim 3 depends from and thus incorporates claim 1 but specifies a rate of stretch of 100% per second. Claim 17 also depends from claim 1 and specifies an amount of stretch of about twice the original length. Claim 19 depends from claim 17 but specifies an amount of stretch of about five times the original length.

U.S. patent 2,983,961 to Titterton, Volume 13 of the *Encyclopedia of Polymer Science and Technology* (1970), the Sumitomo patent, and witnesses for both parties, establish that teachings related to conventional thermoplastic polymers are inapplicable to PTFE.

Articles by Dogliotti and Yelland, *Effect of Strain Rate on the Viscoelastic Properties of High Polymeric Fibrous Materials*, 4 *High Speed Testing* 211 (1964) and Robinson and Graham, *Methods of Characterization of Polymeric Materials by High Speed Testing Techniques*, 5 *High Speed Testing* 261 (1965), teach that conventional plastics and sintered PTFE can be stretched further if stretched slowly. Dr. Gore demonstrated at trial and at oral argument before us that an attempt to stretch highly crystalline, unsintered PTFE slowly results in breakage, and that rapid stretching produces a greatly lengthened rod of soft, flexible material.

The '566 patent contains an example of stretching an article to 16 times its length. Smith and the '915 patent teach that PTFE could not be stretched beyond four times its length without heating it to above its crystalline melt temperature, a step avoided by Dr. Gore and as set forth in the claims.

Sumitomo teaches that there is a length limit to stretching unsintered PTFE, and does not suggest what that limit might be. Markwood, U.S. patent 3,208,100 to Nash (Nash), and U.S. patent 2,823,421 to Scarlett (Scarlett) teach that non-PTFE thermoplastics can be stretched rapidly and to extended lengths, and also teach reduction, elimination, or avoidance of crystallinity before stretching.

The disclosure in the Smith and '915 patents that a PTFE article may be stretched to as much as four times its length encompasses the step of stretching to twice its length set forth in claim 17 and establishes that such step would have been obvious.

[14] Claims 3 and 19 must be considered individually and separately. 35 U.S.C. §282. Nowhere, in any of the references, is it taught or suggested that highly crystalline, unsintered PTFE could be stretched at a rate of about 100 per second as required by asserted claim 3. Nor is it anywhere suggested that by rapid stretching a PTFE article be stretched to more than five times its original length as required by asserted claim 19. On the contrary, the art as a whole teaches the other way.

[15] In concluding that obviousness was established by the teachings in various pairs of references, the district court lost sight of the principle that there must have been something present in those teachings to suggest to one skilled in the art that the claimed invention before the court would have been obvious. *In re Bergel*, 292 F.2d 955, 956-57, 130 USPQ 206, 208 (CCPA 1961); *In re Sponnoble*, 405 F.2d 578, 585, 160 USPQ 237, 244 (CCPA 1969).

The court's pairing of Sumitomo and Markwood disregarded, as above indicated, the undisputed evidence that the unsintered PTFE of Sumitomo does not respond to the conventional plastics processing of Markwood and the art recognition of that fact. *Whiton*, supra, 420 F.2d at 1085, 164 USPQ at 457.

In evaluating claim 19, for example, the pairing disregarded Sumitomo's limited *312 length of stretch teaching. In evaluating claim 3, the court recognized that Sumitomo made no mention of rate of stretch. Looking to Markwood to supply that teaching disregarded not only the conventional plastics-unsintered PTFE distinction but also the clear divergence of Markwood's teaching that crystallinity must be reduced or avoided from the presence of "highly crystalline" in all claims of the '566 patent.

Similarly, and for many of the same reasons, the pairing of Markwood's and Smith's teachings was an inappropriate basis for concluding that the processes set forth in claims 3 and 19 would have been obvious. As above indicated, Markwood's rapid stretching of conventional plastic polypropylene with reduced crystallinity would not suggest rapid stretching of highly crystalline PTFE, in light of teachings in the art that PTFE should be stretched slowly. The Smith patent is owned by du Pont, where Dr. Gore's process invention was considered to have produced a "remarkable new material." That circumstance is not surprising, for Smith, though dealing with PTFE, says not a word about any rate of stretch.

Lastly, the pairing of Sumitomo and the '915 patent suffers from the same shortcomings. The pairing resulted from a hypothetical set forth in Garlock's post trial brief, and was based on no testimony or other evidence in the record. In respect to claim 3, neither reference mentions rate of stretch or suggests its importance. In respect of claim 19 both references point away from the claimed invention in their limited length-of-stretch teachings. The '915 patent states: "the 65 percent expanded material could be expanded a second time for an additional 65 percent expansion or a total length increase ratio of 1:2.72 [less than three times the original length]. However, great care was necessary to obtain a uniformly expanded material at these very great expansion ratios." Thus the '915 patent suggests that the amount of stretch of 500% set forth in claim 19 (more than five times the original length) is not possible.

As indicated, Sumitomo and Smith are totally silent respecting the rate of stretch, and there is simply no teaching in the art that would suggest to one of ordinary skill that Markwood's fast stretching of other thermoplastics could or should be employed in the process of treating PTFE taught by either Sumitomo or Smith. Indeed, Smith not only says nothing about rate of stretch, its preferred teaching is away from other elements of the inventions set forth in claims 3 and 19. Smith discloses that stretching should be done after the PTFE is heated above its crystalline melting point and with decreased crystallinity. Smith teaches:

Below about 300 degreesC it is not possible to draw more than about 4X [times] and while such draw ratios can be attained around 300 degreesC and below the polymer's crystalline melting point with resultant orientation and improved properties it is preferred to use temperatures at or above the polymer's crystalline melting point. (Emphasis

added).

Nash teaches that the film should be plasticized, i.e., made more viscous, before stretching. Contrary to that teaching, Dr. Gore did not reduce crystallinity before increasing the rate of stretch, but maintained the unsintered PTFE "highly crystalline" while stretching at a 100% per second rate and to more than five times, as set forth respectively in claims 3 and 19.

[16] On the entire record and in view of all the references, each in its entirety, it is clear that a person of ordinary skill confronted with a PTFE tape breakage problem would have either slowed the rate of stretching or increased the temperature to decrease the crystallinity. Dr. Gore did neither. He proceeded contrary to the accepted wisdom of the prior art by dramatically increasing the rate and length of stretch and retaining crystallinity. That fact is strong evidence of nonobviousness. *United States v. Adams*, 383 U.S. 39 (1966).

Having learned the details of Dr. Gore's invention, the district court found it within the skill of the art to stretch other material rapidly (Markwood); to stretch PTFE to increase porosity (Sumitomo); and to stretch at high temperatures (Smith). The result is that the claims were used as a frame, and individual, naked parts of separate prior art references were employed as a mosaic to recreate a facsimile of the claimed invention. At no point did the district court, nor does Garlock, explain why that mosaic would have been obvious to one skilled in the art in 1969, or what there was in the prior art that would have caused those skilled in the art to disregard the teachings there found against making just such a mosaic. On the contrary, the references and the uncontested testimony, as above indicated, established that PTFE is sui generis. It is not surprising, therefore, that, unlike the situation in *Stratoflex, Inc. v. Aeroquip Corp.*, 218 USPQ 871 (Fed. Cir. 1983), there was no testimony and no finding that one skilled in the art would transfer conventional thermoplastic processes to those for unsintered PTFE, or would have been able to predict what would happen if they did.

[17] To imbue one of ordinary skill in the art with knowledge of the invention in suit, *313 when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

[18] It is difficult but necessary that the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made (often as here many years), to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art. Had that been here done the inventions set forth in the claims 3 and 19 of the '566 patent could only have been held non-obvious to those skilled in the art at the time those claimed inventions were made.

[19] Error in visualizing the burden of proof on obviousness may have contributed to the court's application here of the prior art. Adopting the phrase from earlier precedents, the court said "the presumption [of validity] is weakened greatly where the Patent Office has failed to consider pertinent prior art." That is not the law of established precedent in this court. *SSIH Equipment S.A. v. ITC*, 218 USPQ 678, 687 (Fed. Cir. 1983); *Solder Removal Co. v. ITC*, 582 F.2d 628, 633, 199 USPQ 129, 133, n. 9 (CCPA 1978). The presumption has no separate evidentiary value. It cautions the decisionmaker against a rush to conclude invalidity. Submission of additional art that is merely "pertinent" does not dispel that caution. It is difficult to imagine a patent law suit in which an accused infringer is unable to add some new "pertinent" art. The inescapable burden of persuasion on one who would prove invalidity, however, remains throughout the trial. 35 U.S.C. §282.

[20] The burden of proving invalidity may of course be facilitated by prior art that is more pertinent than that considered by the PTO. That did not happen here. In the present case, Sumitomo, Smith, and the '915 patent were among references considered by the PTO. Other references referred to as not considered were merely cumulative, disclosing nothing not disclosed in references that were considered by the PTO. The Canadian counterpart of Nash was considered by the PTO. The relevant disclosures of Markwood appear in Sandiford patent 3,544,671 and Paratheon patent 3,637,906, both considered by the PTO. The Russian Author's Certificate 240,997, assuming its status as prior art and whatever the material with which it dealt, contributed nothing beyond the teachings of the '915 patent considered by the PTO.

[21] As discussed more fully below, the district court erred in specifically declining to consider the

objective evidence of nonobviousness. In *re Sernaker*, 702 F.2d 989, 996, 217 USPQ 1, 7 (Fed. Cir. 1983). That evidence can often serve as insurance against the insidious attraction of the siren hindsight when confronted with a difficult task of evaluating the prior art. Though the prior art evidence here pointed more in the direction of nonobviousness than obviousness, the objective evidence may tend, as it did in *Sernaker*, *supra*, to reassure the decisionmaker.

In sum, the district court erred as a matter of law on this record in concluding that Garlock had met its burden of proving that the inventions of claims 3 and 19 of the '566 patent would have been obvious.

(b) '390 patent

(i) §102

The district court found product claims 1, 9, 12, 14, 18 and 43 inherently anticipated because it found that the microstructure of nodes interconnected by fibrils is an inherent characteristic of paste-extruded PTFE products resulting from the process disclosed in Smith. The court found the first four of those claims and claim 43, plus claims 35, 36, 67 and 77 inherently anticipated because high strength PTFE products are inherent in the examples of Sumitomo.

The teachings of Smith include neither a disclosure nor a suggestion of "porous" products having a "microstructure characterized by nodes interconnected by fibrils" as required by the claims found to have been anticipated by Smith.

The teachings of Sumitomo do not include a disclosure of products having "a matrix tensile strength * * * above about 7,300 psi" as required by the claims found to have been anticipated by Sumitomo.

[22] Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. *Soundsciber Corp. v. U.S.*, 360 F.2d 954, 960, 148 USPQ 298, 301, adopted, 149 USPQ 640 (Ct. Cl. 1966). Neither Smith nor Sumitomo disclose an invention set forth in any claim of the '390 patent.

The incongruity in findings that the different processes of Smith and Sumitomo each inherently produced identical products is striking.

Garlock attempted with expert testimony to overcome

the prior art shortcomings as proof of anticipation. Gore rebutted with its own expert testimony. It is unnecessary, however, to resolve apparent conflicts in the divergent testimony, much if not all of which took *314 the form of pure unsupported assertion. No inter partes tests in which the Smith and Sumitomo processes were conducted are of record. No products of those processes were placed in evidence, and there was, of course, no analysis of any such evidentiary products.

Nor is it necessary to evaluate the inappropriate disparagement in Garlock's brief of Dr. Sperati as a "friend" of Gore.

[23] Given the unique nature of unsintered PTFE, we are not persuaded that the "effect" of the processes disclosed in Smith and Sumitomo, an "effect" undisclosed in those patents, would be always to inherently produce or be seen always to produce products meeting all of the claim limitations. Anticipation of inventions set forth in product claims cannot be predicated on mere conjecture respecting the characteristics of products that might result from the practice of processes disclosed in references. In re Felton, 484 F.2d 495, 500, 179 USPQ 295, 298 (CCPA 1973). It is clear that the teachings of neither Smith nor Sumitomo place the products claimed in the '390 patent in possession of the public.

The teachings of Smith and Sumitomo are so unacceptably vague concerning characteristics of products produced by their respective processes as not to support an anticipation rejection. That fact is confirmed by the PTO's having fully considered those references and by its having issued the '390 patent over them.

[24] Garlock's assertion that it employs a process covered by the Smith patent, if true, is irrelevant. The '390 patent was allowed over Smith as a reference. Assuming Smith is a dominating patent, the rule of law is clear that an accused infringer's employment of the process of a dominating patent does not render that employment an anticipation of an invention described and claimed in an improvement patent. As indicated, there is no present record basis for finding that the Smith process in itself necessarily and inherently results in the products, each considered in its entirety, in the claims of the '390 patent. The testimony of Garlock's expert about ex parte tests, the records of which he destroyed before trial, cannot serve as such a basis. The effusive praise of Dr. Gore's claimed products by the owner of the Smith

patented process would appear, on the contrary, to confirm the action of the PTO in issuing the '390 patent.

Garlock has not met its burden of showing that claims 1, 9, 12, 14, 18, and 43 are anticipated by Smith or that claims 1, 9, 12, 14, 35, 36, 43, 67, and 77 are anticipated by Sumitomo.

(ii) §103

[25] The scope and content of the prior art and level of ordinary skill, discussed above in relation to the '566 patent, would be the same for the '390 patent. The district court did not, however, nor does Garlock, apply the Graham criteria, supra, to the '390 claims, apparently assuming that the claimed products, having been found inherent in the processes of Sumitomo and Smith, would have been obvious in view of those references. If so, that was error. Inherency and obviousness are distinct concepts. In re Spormann, 363 F.2d 444, 448, 150 USPQ 449, 452 (CCPA 1966).

In discussing inherency the district court did recognize differences between Smith's disclosure and the inventions set forth in claims 1, 9, 12, 14, 18, and 43, i.e., the absence from Smith of a description of the products of Smith's process as porous and the absence from Smith of a disclosure that those products have a microstructure characterized by nodes interconnected by fibrils.

Similarly, a difference between Sumitomo's disclosure and the inventions set forth in claims 1, 9, 12, 14, 35, 36, 43, 67, and 77 was recognized in the absence from Sumitomo of a quantification of the matrix tensile strengths of the products of Sumitomo's process. The district court also discussed differences between the dependent claims and the prior art. Because we conclude that the independent claims of the '390 patent are patentable over the art of record, we need not discuss the dependent claims.

[26] Having determined that the invention would have been obvious in view of the process of either Smith or Sumitomo, the district court did not discuss the strong showing of objective evidence of nonobviousness here present, saying with respect to one part of such evidence, "no amount of commercial success can save it." That approach was error. All evidence bearing on the issue of obviousness, as with any other issue raised in the conduct of the judicial process, must be considered and evaluated before the required legal conclusion is reached. Stratoflex,

supra, 218 USPQ at 879.

[27] The objective evidence of nonobviousness, i.e., the "indicia" of Graham, supra, may in a given case be entitled to more weight or less, depending on its nature and its relationship to the merits of the invention. It may be the most pertinent, probative, and revealing evidence available to aid in reaching a conclusion on the obvious/nonobvious issue. It should when present always be considered as an integral part of the analysis.

Gore's fabric laminates, for example, as set forth in claims 36 and 77, satisfied a long-felt *315 need for a material having the contradictory properties of being simultaneously breathable (allowing water vapor or perspiration to pass) and waterproof. The record establishes that such a material had long been sought by makers of rainwear and outerwear, and by the U.S. Army as well. That Gore's fabric laminates filled that need is attested by the rise in their annual dollar sales from zero to seven million in the first five years of their availability.

Gore's PTFE tubes for replacement of human arteries and veins, also satisfied a long-felt need. The uncontradicted evidence establishes that Gore's PTFE tubes hold blood without leaking, need not be pre-clotted with the patient's blood, are chemically inert, and, being breathable, are less likely to cause an air embolism. The value and uniqueness of those four properties make Gore's PTFE tubes, as described in unchallenged testimony, "the most important synthetic material presently existing" in vascular surgery, and, along with other evidence in the record, reflect the intended working of the patent system.

As discussed above, current annual sales of over sixty million dollars are attributable to the merits of the products claimed in the '390 patent. Considering the long-felt need for those products and the obvious commercial advantage to be gained by meeting that need, it is reasonable to conclude that the claimed products of the '390 patent would not have been obvious to persons of ordinary skill in the art at the time the claimed inventions were made.

[28] As above indicated, the praise which greeted the products claimed in the '390 patent from PTFE suppliers, including the owner of the Smith patent, is further objective evidence of nonobviousness.

[29] Garlock's appeal argument that the '390 claims are invalid because the recited minimum matrix

tensile strengths are not "critical" is without merit. A claim to a new product is not legally required to include critical limitations. In re Miller, 441 F.2d 689, 696, 169 USPQ 597, 602 (CCPA 1971). The '390 claims are not drawn to optimization of ingredients or ranges within broad prior art teachings, but to new porous PTFE products of particular characteristics.

In sum, and in view of the difficulty of working with unsintered PTFE and its unpredictable response to various processing techniques, the vagueness of Smith and Sumitomo concerning the products produced by those processes, the filling of at least two long-felt needs and the commercial success described above, we conclude that the inventions set forth in claims 1, 9, 12, 14, 18, 35, 36, 43, 67, and 77 of the '390 patent would not have been obvious to those skilled in the art at the time those inventions were made.

(c) §112 and the '566 and '390 patents

The patents in suit resulted from a single application and thus have substantially identical specifications. The holding of invalidity on the basis of §112 is common to both patents.

The district court found that the patents did not disclose sufficient information to enable a person of ordinary skill in the art to make and use the invention, as required by §112, first paragraph, and that certain claim language was indefinite, presumably in light of § 112, second paragraph, because: (1) there was no definition in the specification of "stretch rate," different formulae for computing stretch rate having been developed and presented at trial; (2) there was no way taught in the specification to calculate the minimum rate of stretch above 35 degreesC; (3) the phrase "matrix tensile strength" is indefinite; and (4) the phrase "specific gravity of the solid polymer" is indefinite.

[30] The findings rest on a misinterpretation of §112, its function and purpose. The district court considered whether certain terms would have been enabling to the public and looked to formula developments and publications occurring well after Dr. Gore's filing date in reaching its conclusions under § 112. Patents, however, are written to enable those skilled in the art to practice the invention, not the public. In re Storrs, 245 F.2d 474, 478, 114 USPQ 293, 296-97 (CCPA 1957), and §112 speaks as of the application filing date, not as of the time of trial. In re Mott, 539 F.2d 1291, 1296, 190 USPQ

536, 541 (CCPA 1976). There was no evidence and no finding that those skilled in the art would have found the specification non-enabling or the claim language indefinite on May 21, 1970, when the application which resulted in issuance of Dr. Gore's patents was filed. Indeed, the expert quoted by the district court and whose testimony was primarily relied upon respecting formulae, was still in school at that time.

There is uncontradicted evidence in the record that at the time the application was filed "stretch rate" meant to those skilled in the art the percent of stretch divided by the time of stretching, and that the latter was measurable, for example, with a stopwatch. Concern for the absence from the specification of a formula for calculating stretch rate is therefore misplaced, and the post-filing date development of varying formulae, including Dr. Gore's later addition of a formula in his corresponding Japanese patent, is irrelevant.

[31] *316 Section 112 requires that the inventor set forth the best mode of practicing the invention known to him at the time the application was filed. Calculating stretch rate at that time was accomplished by actually measuring the time required to stretch the PTFE material. That was the only mode then used by the inventor, and it worked. The record establishes that calculation by that mode would have been employed by those of ordinary skill in the art at the time the application was filed. As indicated, Dr. Gore's disclosure must be examined for §112 compliance in light of knowledge extant in the art on his application filing date.

[32] The district court, though discussing enablement, spoke also of indefiniteness of "stretch rate," a matter having to do with §112, second paragraph, and relevant in assessment of infringement. The use of "stretching * * * at a rate exceeding about 10% per second" in the claims is not indefinite. Infringement is clearly assessable through use of a stopwatch. No witness said that could not be done. As above indicated, subsequently developed and therefore irrelevant formulae cannot be used to render non-enabling or indefinite that which was enabling and definite at the time the application was filed.

[33] Similarly, absence from the specification of a method for calculating the minimum rate of stretch above 35 degreesC does not render the specification non-enabling. The specification discloses that "[t]he lower limit of expansion rates interact with

temperature in a roughly logarithmic fashion, being much higher at higher temperatures." Calculation of minimum stretch rate above 35 degreesC is nowhere in the claims, and it is the claimed invention for which enablement is required. The claims require stretching at a rate greater than 10% per second at temperatures between 35 degreesC and the crystalline melt point of unsintered PTFE. That the minimum rate of stretch may increase with temperature does not render non-enabling Dr. Gore's specification, particularly in the absence of convincing evidence that those skilled in the art would have found it non-enabling at the time the application was filed.

[34] The district court invalidated both patents for indefiniteness because of its view that some "trial and error" would be needed to determine the "lower limits" of stretch rate above 10% per second at various temperatures above 35 degreesC. That was error. Assuming some experimentation were needed, a patent is not invalid because of a need for experimentation. *Minerals Separation, Ltd. v. Hyde*, 242 U.S. 261, 270-71 (1916). A patent is invalid only when those skilled in the art are required to engage in undue experimentation to practice the invention. *In re Angstadt*, 537 F.2d 498, 503-04, 190 USPQ 214, 218 (CCPA 1976). There was no evidence and the court made no finding that undue experimentation was required.

[35] Moreover, the finding here rested on confusion of the role of the specification with that of the claims. The court found that the specification's failure to state the lower limit of stretch rate (albeit above 10% per second) at each degree of temperature above 35 degreesC (a requirement for at least hundreds of entries in the specification) did not "distinguish processes performed above the 'lower limit' from those performed below the 'lower limit'." The claims of the '390 patent say nothing of processes and lower limits. Distinguishing what infringes from what doesn't is the role of the claims, not of the specification. It is clear that the specification is enabling. *In re Storrs*, supra, and that the claims of both patents are precise within the requirements of the law. *In re Moore*, 439 F.2d 1232, 169 USPQ 236 (CCPA 1971).

[36] The finding that "matrix tensile strength" is indefinite, like the other findings under §112, appears to rest on a confusion concerning the roles of the claims and the specification. While finding "matrix tensile strength" in the claims indefinite, the

district court at the same time recognized that the specification itself disclosed how to compute matrix tensile strength, in stating "to compute matrix tensile strength of a porous specimen, one divides the maximum force required to break the sample by the cross sectional area of the porous sample, and then multiplies this quantity by the ratio of the specific gravity of the solid polymer divided by the specific gravity of the porous specimen." Further, the specification provided the actual matrix tensile strength in several examples. It is well settled that a patent applicant may be his own lexicographer. In light of the disclosure of its calculation in the specification, we cannot agree that "matrix tensile strength" is either indefinite or non-enabling.

Nor does absence from the specification of a definition for "specific gravity of the solid polymer," a part of the computation of matrix tensile strength, render that computation indefinite. It is undisputed that in the many examples in the application the specific gravity values used for unsintered and sintered PTFE were 2.3 and 2.2, respectively. There was no testimony that those values were not known to persons of ordinary skill in the art or could not be calculated or measured. There is simply no support for the conclusion that "specific gravity of the solid polymer" is indefinite or that absence of its definition renders *317 the specification non-enabling. See *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

We conclude that Garlock has failed to prove that at the time the application was filed, the specification was not enabling or that the claims were indefinite within the meaning of §112.

(2) Fraud

[37] Fraud must be shown by clear and convincing evidence. *Norton v. Curtiss*, 433 F.2d 779, 797, 167 USPQ 532, 546-47 (CCPA 1970).

The state of mind of the one making the representations is probably the most important of the elements to be considered in determining the existence of "fraud." * * * Good faith and subjective intent, while they are to be considered, should not necessarily be made controlling. Under ordinary circumstances, the fact of misrepresentation coupled with proof that the party making it had knowledge of its falsity is enough to warrant drawing the inference that there was a fraudulent intent. Where public policy demands a complete and accurate disclosure it may suffice to show nothing more than that the misrepresentations

were made in an atmosphere of gross negligence as to their truth. [emphasis in original].

Norton, 433 F.2d at 795-96; 167 USPQ at 545; see, *Miller*, *Fraud on the PTO*, 58 JPOS 271 (1976).

Garlock alleges fraud in Gore's representations that stretching PTFE tape at a rate greater than 10% per second was novel and that it produces a physical phenomenon. The district court found the evidence insufficient to establish that Gore had a specific intent to defraud the PTO. No basis exists for our overturning that finding. Accordingly, we agree with the district court that Garlock has failed to sustain its heavy burden of proving, by clear and convincing evidence, sufficient facts from which fraudulent intent can be inferred.

Garlock points to a September 4, 1975, Gore affidavit filed in the PTO that stated:

2. Prior to my invention disclosed in the captioned patent application, during production of expanded PTFE products by W. L. Gore & Associates, Inc., the rate of stretching was neither measured nor controlled and to my knowledge did not involve stretching of unsintered PTFE at a rate exceeding about 10% per second. (emphasis in original)

No finding of the district court and no evidence of record establishes that that statement was made in reckless disregard of facts from which an intent to defraud may be inferred.

The district court's finding in 1982 that the 401 machine inherently stretched tape at some time in 1969 at a rate more than 10% per second, does not establish that Dr. Gore was aware of that fact in 1975, nor does it make untrue his statement that to his knowledge that had not been the rate of stretch employed. Nor does the district court's finding conflict with Dr. Gore's statement that the rate of stretching was neither measured nor controlled in the Gore shop before his invention of the claimed process as a whole.

Nor does the evidence of isolated statements support Garlock's contention that Dr. Gore attempted to convince the PTO that a physical phenomenon always existed in which stretching at a rate greater than 10% per second always produced a matrix tensile strength greater than 7300 psi. On the contrary, Dr. Gore set forth in his specification examples indicating that some samples broke, ruptured, or disintegrated.

(3) Attorney's Fees

The district court did not abuse its discretion in denying Garlock its request for attorney fees.

Infringement

[38] Where, as here, an appellate court reverses a holding of invalidity, and remand is ordered for trial of the factual issue of infringement, an inefficient use of judicial resources results if the second judgment is appealed. The better practice would therefore be for the district court to decide both the validity and infringement issues when both are contested at the trial, enabling the conduct of a single appeal and disposition of the entire case in a single appellate opinion.

Resolution of the infringement issue at trial may also overlap with resolution of the validity issue, where, for example, the claimed invention was or was not copied by the validity challenger, or the challenger substituted the claimed invention for freely available prior art processes or products, Eibel, supra, 261 U.S. at 56, or an assertion of nonenablement may conflict with the ease with which the accused infringer may be shown to have practiced the invention as taught in the patent. Eibel Process Co. v. Minnesota & Ontario Paper Co., 261 U.S. 45, 61 (1923).

[39] The district court having declined to decide the infringement issue, Gore suggests that the record here is sufficient to warrant *318 our deciding it now. With reluctance in view of the length and bitter nature of the present litigation, we decline the suggestion. In so doing, we imply nothing of our view on the issue. Nor do we intend any implication that the district court could not itself determine the infringement issue on the present record. Infringement of particular claims of two patents was asserted. None of those claims has been finally held invalid. Assuming their continued assertion, infringement must be decided with respect to each asserted claim as a separate entity. Altoona, supra, 294 U.S. at 487. Those factual determinations should be made in the first instance by the district court.

Decision

The holdings of invalidity of claim 1 of the '566 patent under §102(a) and of claim 17 of the '566 patent under §103, the determination that Gore did not commit fraud on the PTO, and the denial of attorney fees, are affirmed; the holdings that all claims of the '566 patent are invalid under §102(b), that claims 3 and

19 of the '566 patent are invalid under §103, and that all claims of the '566 patent are invalid under §112, are reversed. The holdings that claims 1, 9, 12, 14, 18, 35, 36, 43, 67, and 77 of the '390 patent are invalid under §§102 and 103, and that all claims of the '390 patent are invalid under § 112, are reversed. The case is remanded for determination of the infringement issue.

Affirmed in part, reversed in part, and remanded.

APPENDIX

Appendix

Claims of the '566 patent discussed at trial:

1. A process for the production of a porous article of manufacture of a polymer of tetrafluoroethylene which process comprises expanding a shaped article consisting essentially of highly crystalline poly (tetrafluoroethylene) made by a paste-forming extrusion technique, after removal of lubricant, by stretching said unsintered shaped article at a rate exceeding about 10% per second and maintaining said shaped article at a temperature between about 35 degreesC. and the crystalline melt point of said tetrafluoroethylene polymer during said stretching.

3. The process of claim 1 in which the rate of stretch is about 100% per second.

17. The process of claim 1 in which the shaped article is expanded such that its final length in the direction of expansion is greater than about twice the original length.

19. The process of claim 17 in which said final length is greater than about five times the original length.

Claims of '390 patent discussed at trial:

1. A porous material consisting essentially of highly crystalline polytetrafluoroethylene polymer, which material has a microstructure characterized by nodes interconnected by fibrils and has a matrix tensile strength in at least one direction above about 73,00 psi.

9. A porous material consisting essentially of polytetrafluoroethylene polymer, which material has a microstructure characterized by nodes interconnected by fibrils and has a matrix tensile strength in at least one direction above 9290 psi, which material has been heated to a temperature

above the crystalline melt point of said polymer and has a crystallinity below about 95%.

12. A porous material in accordance with claim 9 which is in the form of a shaped article.

14. A product in accordance with claim 12 which is in the form of a film.

18. A product in accordance with claim 12 which is in the form of continuous filaments.

35. A laminated structure comprising (a) a first shaped article formed of a porous material made of a tetrafluoroethylene polymer, which material has a microstructure characterized by nodes interconnected by fibrils and has a matrix tensile strength in at least one direction above about 7,300 psi, and (b) a second shaped article bonded to said first shaped article.

36. The structure of claim 35 in which said first shaped article is formed of a porous material which has a matrix tensile strength in at least one direction of at least 9290 psi, and has a crystallinity below about 95%.

43. A porous material made of a tetrafluoroethylene polymer, which material has a microstructure characterized by nodes interconnected by fibrils, which material (a) has a matrix tensile strength in at least one direction above about 9290 psi, (b) has been heated to a temperature above 327 degrees C. and has a crystallinity below about 95%, and (c) has a dielectric constant of 1.2-1.8.

67. An impregnated structure comprising

(a) a shaped article formed of a porous material made of a tetrafluoroethylenepolymer which material has a microstructure characterized by nodes interconnected by fibrils and a matrix tensile strength in at least one direction above about 9290 psi, and

***319** (b) a polymer impregnated within the pores of the said shaped article.

77. The structure of claim 35 in which the first shaped article is a sheet having pores that will pass a gas but will not pass liquid water.

FN1 35 U.S.C. §102(a) and (b) provide:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or * * *35 U.S.C. §103 provides:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.35 U.S.C. §112 provides:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. A claim may be written in independent or dependent form, and if in dependent form, it shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim.

Davis, Circuit Judge, concurring in the result in part and dissenting in part.

I concur in the result on (1) the validity of the '390 patent under §§ 102-103; (2) the validity of the '390 patent under §112; (3) the invalidity of claims 1 and 17 of the '566 patent; (4) lack of fraud on the Patent and Trademark Office; and (5) denial of attorneys' fees. I disagree and dissent as to the validity of claims 3 and 19 of the '566 patent.

1. The process invention embodied in claim 1 of the '566 patent was known, through use of the 401

machine in the Gore shop, well before the "invention date" (claimed by Robert Gore, the inventor) of October 1969. [FN1] As such, the claimed invention was invalid on at least three grounds: (i) it was anticipated and therefore would have been obvious (under 35 U.S.C. §103) at the time of the claimed invention date; (ii) the invention was "in public use" by the Gore shop (under 35 U.S.C. §102(b)) more than one year prior to the patent application (i.e., prior to May 21, 1969); and (iii) the invention (made by Robert Gore) was known to and used "by others in this country" (35 U.S.C. § 102(a)) before the claimed invention date of October 1969, i.e. the invention was used by Wilbert Gore and others in the Gore shop before the October date. [FN2]

The critically important aspect of the invention of the '566 patent is the stretching of PTFE at a rate above 10% per second. [FN3] Robert Gore testified that he conceived this invention no earlier than October 1969 (and we have the right to take him at his word), [FN4] but the facts found by the District Court plainly show that the Gore shop was in fact practicing that invention considerably earlier.

The District Court found that in the 401 machine the distance between the stretch rollers controls the rate of stretch; a shorter distance results in a higher rate of stretch; for the process described in the '915 patent to be practiced with a rate of stretch below 10% per second, the distance between the stretch rollers would have to be greater than five feet; if the distance is less than four feet, the rate of stretch is greater than 10% per second; the machine drawings used to construct the 401 machine indicate that the distance between the stretch rollers was eight inches; a Gore employee testified that "I am reasonably sure that no effective [stretch] rolls in question would have been more than three feet simply because of the nature and size of the equipment" and that he did not remember any stretching more than three feet; another Gore employee testified that the distance between the rollers was "a maximum of 18 inches" (emphasis added); a document prepared by the same employee (an engineer) on June 10, 1969 reports that the stretch span was 8 inches; the 401 machine was the only stretching machine used by the Gore company; and the 401 machine was never substantially changed before October 1969. All this adds up to the fact that the 401 machine was at all relevant times operated with a stretch of less than four feet. [FN5] There is no question that the machine was so operated before October 1969 (the District Court found that sales of tape made by the 401 machine were proposed in August 1969).

I can accept Robert Gore's affidavit (to the PTO) that there was no stretching in the Gore shop at a rate exceeding about 10% per second prior to "my invention disclosed in the captioned patent application" (emphasis added) [FN6] only because that declaration was expressly qualified by the phrase "to my knowledge" (emphasis added). The District Court specifically found no specific intent by Robert Gore to defraud and, on this record, we *320 cannot properly overturn that finding. But the absence of personal intent to defraud does not mean or say that, whether Robert Gore realized it or not, the 401 machine was not actually operating, well before October 1969, to stretch unsintered PTFE at a rate exceeding about 10% per second. Cf. *O'Brien v. Westinghouse Electric Corp.*, 293 F.2d 1, 10 (3rd Cir. 1961). It seems impossible to me to reconcile Robert Gore's insistence on two facts-- that (i) he invented the process in October 1969 and (ii) he had no knowledge prior to October 1969 of stretching PTFE at the critical rate-- with the solid facts in the record as to the prior operation of the 401 machine, except on the view that Robert Gore did not realize that he and others in the Gore shop had made his invention previously.

2. It follows that in October 1969 the invention of '566 would have been obvious under §103 to Robert Gore because the prior practice of the 401 machine constituted prior art. Even if this was not prior art technically within §102, that statutory provision "is not the only source of prior art." *In re Fout*, 675 F.2d 297, 300 (CCPA 1982, emphasis in original). The 401 machine was practiced under the '915 patent (issued to Wilbert Gore) and, whether or not Robert Gore subjectively realized what was happening, he and others in the Gore shop were practicing the invention later embodied in the '566 patent. That was prior art at least as to Robert Gore. *Id.* at 300-01. [FN7]

3. If it be thought necessary to invoke §102 directly, in order to show anticipation, the record contains proof that the 401 machine was designed, constructed and used (just as described supra) in November and December 1968 and the early months of 1969--more than one year prior to the '566 patent application of May 21, 1970. See *Jt. App. E 1199-E 1200*. Section 102(b) therefore applies. Although commercial production was apparently not actively sought until June 1969, the practicing of the 401 machine prior to May 21, 1969 was "a public use" because the Gore company made "use of the device * * * in the factory in the regular course of business." *Connecticut Valley Enterprises, Inc. v. United States*, 348 F.2d 949, 952,

146 USPQ 404, 406 (Ct. Cl. 1965).

4. Also, §102(a) [FN8] applies here because Robert Gore was the inventor in the '566 patent and Wilbert Gore and others in the Gore shop were using the 401 machine before October 1969. Wilbert Gore (the inventor in the '915 patent under which the 401 machine was made and used) and the other employees are "others" within §102(a)--they are not the same as Robert Gore who claimed to be inventor of the process that ripened into the '566 patent. [FN9] See also § 102(f), which would bar Robert Gore if he did not himself invent the subject matter of the '566 patent. [FN10]

5. The majority sustains the validity of claims 3 and 19 of the '566 patent (the claims also involved in appellant's suit for infringement) which are dependent on invalid claim 1. Because of the invalidity of claim 1 the only possible novelty in claim 3 would be the requirement that the rate of stretch would be about 100% per second, and the possible novelty of claim 19 would be that the final length would be greater than about five times the original length. My position is that both of these added elements, if novel, would have been obvious to persons of ordinary skill in the art.

The defect in the majority's analysis is that it neglects the cardinal fact that the prior art included the 401 machine (discussed supra), not merely the earlier patents assessed in the majority opinion. The 401 machine directly involved PTFE itself, not conventional thermoplastic polymers. That machine also directly involved rapid stretching of PTFE at a rate markedly exceeding 10%. With this prior art of the 401 machine before him, an ordinary person skilled in the art would maximize stretch rate, if only to improve the machine's production rate. Cf. *In re Dwyer, Jewell, Johnson, McGrath, & Rubin*, 317 F.2d 203, 207, 137 USPQ 540 (CCPA 1963). Moreover, the very existence and operation of the 401 machine, which stretched PTFE rapidly without breaking, suggests to the skilled person the probability of stretching at even higher rates. Certainly, in the light of the 401 machine, skilled workers would see in at least *321 the prior Markwood, Nash, and Scarlett patents (teaching extensive and rapid stretching of non-PTFE thermoplastics) the suggestion that the method of the 401 machine could also be used for comparable rapid and extensive stretching of PTFE.

6. In sum, I cannot escape the conclusion that--although there was no fraud proved--if the true facts as to the 401 machine had been made known to the PTO

(as it requested), the involved claims of the '566 patent should (and probably would) not have been accepted.

FN1 The 401 machine was used under the prior '915 patent (issued to Wilbert Gore) which contains no reference to the significance of the rate of stretch.

FN2 Aside from the bases I discuss, I do not reach the other grounds asserted for invalidity of the '566 patent.

FN3 Before the PTO Robert Gore concededly referred to this as "critical" to his invention or as his "invention."

FN4 The District Court found that October 1969 was the earliest date Robert Gore asserts for his conception of the invention in the '566 patent.

FN5 The Gores (Robert and Wilbert) testified at trial that the distance was five feet but there is no indication that the trial court (which did not cite this testimony but did cite the opposing evidence) credited the Gores' testimony.

FN6 The factor of the rate of stretching was of direct interest to the examiner during the prosecution of the '566 patent. In response to the examiner's express request for a declaration that the Gore firm's production of stretched PTFE tape, prior to Robert Gore's invention asserted here, did not involve stretching of unsintered PTFE at a rate exceeding about 10% per second, Robert Gore filed an affidavit in the PTO specifically stating that "to my knowledge" (emphasis added) the 401 machine did not involve stretching at a rate exceeding about 10% per second.

FN7 The District Court has found that there are no differences between claim 1 of the '566 patent and the processes previously used by the Gore firm to produce paste-extruded unsintered PTFE.

FN8 An invention is anticipated if it "was known or used by others in this country * * * before the invention thereof by the applicant for patent" (emphasis added).

FN9 It is undisputed that it was Wilbert Gore who initiated the project for the 401 machine and watched over it.

FN10 The majority's discussion of "secondary considerations," though it is relevant to other aspects of this case, is irrelevant to the issue of anticipation raised by the 401 machine, and hardly persuasive as to the issues of obviousness based on or with respect to the 401 machine.

Appendix 5:

In re McLaughlin, 443 F.2d 1392, 170 U.S.P.Q. 209 (C.C.P.A. 1971).

In re McLaughlin

Court of Customs and Patent Appeals

No. 8474

Decided June 24, 1971

United States Patents Quarterly Headnotes

PATENTS

[1] Patentability -- Anticipation -- Combining references (§ 51.205)

Test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art.

PATENTS

[2] Patentability -- Invention -- In general (§ 51.501)

Any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, but so long as it takes into account only knowledge which was within level of ordinary skill at time claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, reconstruction is proper.

PATENTS

[3] Patentability -- Evidence of -- Commercial success -- In general (§ 51.4551)

Recognizing that inference of obviousness drawn from prior art disclosures is only prima facie justification for drawing ultimate legal conclusion that claimed invention is unpatentable under 35 U.S.C. 103, it is imperative that such secondary considerations as commercial success and adaptation by competitor also be evaluated in determining final validity of that legal conclusion; this is true even where claimed invention involves only relatively simple mechanical concepts.

PATENTS

Particular patents--Railway Cars

McLaughlin, Compartment Arrangement for Railway Cars, claim 15 of application allowed; claims 13 and 14 refused.

***210** Appeal from Board of Appeals of the Patent Office.

Application for patent of Gerald McLaughlin, Serial No. 566,701, filed July 5, 1966; Patent Office Group

317. From decision rejecting claims 13 to 15, applicant appeals. Affirmed as to claims 13 and 14; reversed as to claim 15.

Norman Lettvin, Chicago, Ill., for appellant.

S. Wm. Cochran (R. V. Lupo of counsel) for Commissioner of Patents.

Before Rich, Almond, Baldwin, and Lane, Associate Judges, and Re, Judge, United States Customs Court, sitting by designation.

Baldwin, Judge.

McLaughlin has appealed from the decision of the Patent Office Board of Appeals sustaining the rejection of claims 13, 14 and 15 in his application [FN1] as unpatentable under 35 U.S.C. 103 in view of the prior art. One claim has been held allowable.

The Invention

The subject matter of the claims on appeal may be characterized as an improved construction arrangement for railroad "boxcars" which are adapted for carrying "unitized" cargo. The latter term is defined by appellant as "cargo that is loaded upon a cargo-handling platform (such as a pallet or slip sheet) of a pre-selected size, and which is arranged for transfer between stations by devices such as fork-lift trucks."

Appellant states that prior art arrangements, having the doorways located substantially centrally in the opposed sidewalls, leave the center of the car unsuitable for holding additional pallets securely because side filler panels cannot be placed over the doorways without inconveniencing loading and unloading.

The present invention, as represented in Figure 2 of the application, which we reproduce below along with Figure 3, is alleged to permit a larger volume of freight to be conveniently loaded in a car with the same overall dimensions.

Image 1 (1.5 X 4) Available for Offline Print

***211**

Image 2 (2.5 X 3.25) Available for Offline Print

The car used in this arrangement has the door

openings 39 (left hand occurrence) and 40 in the opposite sidewalls offset longitudinally so that each sidewall includes a long wall section and a short wall section on opposite sides of the opening. Side filler panels 43 and 45 are affixed to the interiors of the long wall sections 37 and 34, respectively, and longitudinally adjustable bulkheads 47 and 48 are provided. The car is shown completely filled with groups of palletized containers 51 and 52, secured in position by the side filler panels and bulkheads. The application describes the loading of this car as follows:

Typically, the load dividers 47 and 48 are initially moved to the left of doorway 40 to permit free access to the floor surface area in the "deep end" of the car bounded by end wall 30. The pallets 51 are placed into the car in sequence, adjusting the side fillers to the necessary width required to firmly confine the pallets in place. During this time, door 49 is already closed to form the lateral support for the six pallet stacks 51 nearest load divider 48. The load divider 48 is then moved into position against the stacked pallets 51 and locked in place. The second load divider 47 is then temporarily positioned closely adjacent load divider 48 to permit free access to the "short end" of the car terminated by end wall 31. Pallets 52 are then sequentially placed in position, adjusting the side fillers 45 to retain these pallets against lateral shifting. The three side fillers in the series 45 which are closest to the load divider 47 are preadjusted prior to loading the six pallet stacks 52 nearest load divider 47. Finally, load divider 47 is moved into tight engagement with the stacked pallets 52, locked in place, and the door 50 is closed to secure the pallets 52.

The only independent claim on appeal is claim 13 which we reproduce as follows:

13. An improved car-loading construction for use in elongated, wall- enclosed railway cars of the type utilizing therein longitudinally movable load-confining transverse bulkheads which are adapted to be located generally centrally of the ends of the car to project across substantially the entire width of the car;

said improved car-loading construction comprising, in combination,

the longitudinal side walls of the car each having a single doorway therein located between the ends of the wall to divide the wall into spaced long and

short sections,

the doorways being offset toward different ends of the car so that the major portion of each doorway is directly opposite the long wall section of the opposing side wall, and

side filling panels mounted on the inside surface of each of said long wall sections and being adjustable toward and away from the corresponding long wall section, so that the transversely adjustable side filling panels on one long wall section and a longitudinally adjustable transverse bulkhead may cooperate to substantially fully enclose the load in one end of the car substantially to the mid-point of the car without adversely affecting the ability to load the other end of the car.

Claim 14 adds the additional limitations that the car is adapted to carry pallet-mounted loads and the lengths of the side walls of the car conform substantially to whole multiples of a dimension of a pallet. Claim 15 further provides that the portion of each doorway directly opposite a wall is "substantially equal *212 to a plural multiple of a dimension of the pallet" and that the rest of the doorway is narrower than a pallet dimension.

The Rejection

Claims 13, 14 and 15 were rejected as unpatentable over Cook [FN2] in view of either Robertson [FN3] and Aquino [FN4] or of Lundvall, [FN5] under 35 U.S.C. 103.

Cook discloses a railway box car having sides defining oversized door openings in diagonally opposite ends of the car. That construction is described as facilitating loading and unloading lumber, permitting it to be palletized and to be handled by lift trucks.

Lundvall discloses a railway car provided with adjustable side filler panels for preventing lateral shifting of the load and adjustable bulkheads to hold the load against longitudinal shifting.

Robertson discloses a specific side filler panel construction for railway cars and Aquino is directed to a bulkhead construction for similar use.

The examiner and board based their holdings that the appealed claims are unpatentable on the view that persons of ordinary skill in the art would find it

obvious to use bulkheads and side filler panels, as disclosed in the secondary references, in connection with loads placed in a car of the Cook construction.

Opinion

Appellant has strenuously urged that the reference disclosures were improperly combined. In particular, with regard to Cook, he argues that, while the reference does show elongated, longitudinally offset doors, it does not suggest such an arrangement in combination with a bulkhead and side fillers because of the patentee's expressed desire to have a car capable of being loaded and unloaded simultaneously from both sides, which is not the desire of appellant nor even possible, he urges, with his arrangement.

[1] We have taken the above argument into consideration and do find that it has some merit. Nevertheless, it is not convincing. It should be too well settled now to require citation or discussion that the test for combining references is not what the individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the

[2] art. Any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper. The Cook patent does indicate that the car shown therein is suitable for carrying palletized loads with lift trucks being used for the loading and unloading, including stacking of the pallets. Since the secondary references show that it was well known to use side filler panels and bulkheads to confine palletized loads to prevent lateral and longitudinal shifting, we agree that those references would have suggested use of such panels and bulkheads with the Cook car for the same purpose.

[3] The foregoing conclusion in itself, however, is not determinative of the present appeal. Appellant has submitted evidence tending to prove that his invention has solved the longstanding problem of utilizing the maximum amount of space in standard, 50-ft. boxcars, permitting loading the car with 56 pallets of 48' x 40', whereas prior to the invention, cars of that size could be loaded with only 46 such pallets properly confined. The evidence, comprising two affidavits and a series of exhibits, indicates that

the invention has been commercially successful and that its concept was promptly adapted by a competitor. Recognizing that the inference of obviousness drawn from the prior art disclosures is only prima facie justification for drawing the ultimate legal conclusion that the claimed invention is unpatentable under 35 U.S.C. 103, it is imperative that such secondary considerations also be evaluated in determining the final validity of that legal conclusion. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). We emphasize that such is true even where, as here, the claimed invention involves only relatively simple mechanical concepts. As we have said on another occasion: "A patentable invention, within the ambit of 35 U.S.C. 103, may result even if the inventor has, in effect, merely combined features, old in the art, for their known purpose, without producing anything beyond the results inherent in their use." *In re Spinnoble*, 56 CCPA 823, 405 F.2d 578, 160 USPQ 237 (1969).

The first affidavit was by appellant, himself, the manager of the Customer Relations Department of the Equipco division of Unarco Industries, Inc., the assignee of the application. He asserts that 355 railway cars *213 equipped for use with his invention, valued at nearly eight million dollars, were ordered within little more than a year. Included with this affidavit are a series of reproductions of trade journal articles and advertisements tending to support the further assertion made in the affidavit, that the problem of effectively utilizing space was a familiar one. One exhibit is a copy of the advertisement of a competitor, tending to indicate that appellant's concept was adopted by that competitor. The other affidavit is by John Clement, general traffic manager with the Corn Products Co. and apparently a disinterested third party. The affiant states that he has the duty of obtaining all the railroad and other types of cargo equipment necessary for shipping the company's products and that he became interested in the invention immediately upon its being disclosed to him because it appeared to solve problems presented by prior railway car arrangements, allowing use of substantially the entire cargo carrying capacity of the car while permitting truck loading. The affidavit further states that Corn Products had already received 10 cars possessing the proposed arrangement, had ordered 11 more and was negotiating for an additional forty.

The examiner did not consider the affidavits persuasive. That of Clement he characterized as alleging that appellant's arrangement is more versatile than prior arrangements without advancing any factual

support. He regarded appellant's own affidavit as lacking sufficient facts to show that the asserted commercial success resulted from the invention as claimed. The board did not comment on either affidavit in its opinion.

Our own consideration of the affidavits in light of appellant's arguments convinces us that there was a problem in the art due to floor space in the mid-section of cars with side doorways not ordinarily being usable for palletted goods which require securing against transverse and lateral shifting. Moreover, the favorable opinion Clement expressed of the invention and the showing of extensive purchases of equipment for utilizing it indicate that appellant provided an unobvious solution of the problem. The affidavits reveal the solution as involving the arrangement substantially as described in applicant's application. Thus an arrangement is required wherein the relationship of the dimensions of the long and short wall sections and the door openings of the car are such that the pallets may be machine-loaded substantially to its full capacity. We note that these features are brought out fully only in claim 15 which recites that the long and short sections of the side walls are substantially equal to whole multiples of a dimension of a pallet and that the portions of the doorway directly opposite each other have a width equal to a plural multiple of a dimension of a pallet. As to that claim, we find appellant's secondary evidence adequate to rebut the initial inference of obviousness and, accordingly, reverse the decision of the board.

On the other hand, the affidavit showings do not demonstrate that an arrangement lacking any of the characteristics defined in claim 15 solved the previous space-utilization problem or that the commercial success was due to less than all of those features. As to claims 13 and 14, thus, the prima facie case of obviousness made out by the prior art stands un rebutted and the board's decision pertaining thereto must be sustained.

The decision of the board is affirmed as to claims 13 and 14 and reversed as to claim 15.

FN1 Serial No. 566,701, filed July 5, 1966, for "Compartment Arrangement for Railway Cars."

FN2 Patent No. 2,930,332, granted March 29, 1960.

FN3 Patent No. 3,212,458, granted October 19, 1965.

FN4 Patent No. 3,217,664, granted November 16, 1965.

FN5 Patent No. 3,163,130, granted December 29, 1964.

Cust. & Pat.App.

170 U.S.P.Q. 209

END OF DOCUMENT

Appendix 6:

In re Young, 927 F.2d 588, 18 U.S.P.Q.2d 1089 (Fed. Cir. 1991).

United States Court of Appeals,
Federal Circuit.

In re D. Raymond YOUNG and John C. Wride.

No. 90-1368.

March 5, 1991.

The Board of Patent Appeals and Interferences rejected all claims in a patent application disclosing the method and apparatus for generating an acoustic pulse in water, to aid offshore seismic exploration. Applicants appealed. The Court of Appeals, Rader, Circuit Judge, held that the claims were obvious in light of a prior patent for a seismic exploration method.

Affirmed.

West Headnotes

[1] Patents ☞ 16(1)
291k16(1)

Test for obviousness is what combined teachings of references would have suggested to one of ordinary skill in art. 35 U.S.C.A. § 103.

[2] Patents ☞ 16(2)
291k16(2)

Patents are parts of literature of art and are relevant for all they contain. 35 U.S.C.A. § 103.

[3] Patents ☞ 16(3)
291k16(3)

When prior art contains apparently conflicting references, Board of Patent Appeals must weigh each reference for its power to suggest solutions to artisan of ordinary skill; Board must consider all disclosures of prior art to extent that references are in analogous fields of endeavor and thus would have been considered by person of ordinary skill in field of invention. 35 U.S.C.A. § 103.

[4] Patents ☞ 16(2)
291k16(2)

When prior art contains apparently conflicting references, Board of Patent Appeals, in weighing suggestive power of each reference, must consider

degree to which one reference might accurately discredit another. 35 U.S.C.A. § 103.

[5] Patents ☞ 16.33
291k16.33

Board of Patent Appeals and Interferences properly rejected, on grounds of obviousness, all claims in patent application disclosing method and apparatus for generating acoustic pulse in water, to aid offshore seismic exploration; despite being criticized, prior patent for seismic exploration method, which concerned minimizing double oscillation for chemical explosives used in marine seismic exploration, expressly taught spacing limitation in each of claims set forth in application. 35 U.S.C.A. § 103.

Patents ☞ 328(2)
291k328(2)

2,619,186. Mentioned as prior art.

*589 Richard F. Phillips, Jr., Exxon Co., U.S.A., Houston, Tex., argued, for appellants.

Lee E. Barrett, Associate Sol., Arlington, Va., argued, for appellee. With him on the brief was Fred E. McKelvey, Sol.

Before NEWMAN, LOURIE, and RADER, Circuit Judges.

RADER, Circuit Judge.

Raymond Young and his co-inventor John Wride (collectively Young) appeal from the October 31, 1989 and April 18, 1990 decisions of the Board of Patent Appeals and Interferences (Board). These decisions affirmed the final rejection of all claims in their application. The Board held Young's claimed invention obvious under 35 U.S.C. § 103. This court affirms.

BACKGROUND

Young's application discloses a method and apparatus for generating an acoustic pulse in water. Acoustic pulse technology facilitates offshore seismic exploration. The acoustic pulse generates a large gas bubble in the ocean above geological formations on the ocean floor. The rapid expansion and collapse of the gas bubble create a shock wave in the water. The shock wave propagates through the water into the

formations below the ocean bed. As the shock wave passes downward through these formations, each interface between adjoining earth strata reflects a portion of the shock wave. These reflections move upward through the ocean. Hydrophones at the ocean's surface can monitor these reflections. From these monitored reflections, geologists can generate a "seismic section" map which shows the configuration of strata in the ocean bed.

Today's most common sources of seismic shock waves are air guns. These air guns feature a chamber for storing and releasing on command highly compressed air. A high-pressure hose charges the gun with compressed air for rapid firing during a seismic survey.

Acoustic pulse technology suffers from problems with bubble oscillation. Upon release of the compressed air, the bubble undergoes a rapid initial expansion and collapse. Several more expansions and collapses follow the initial collapse, but with diminishing amplitude. Each of these expansion-collapse events creates an additional shock wave. The geological strata reflect each of these additional shock waves. The multiple reflections, in turn, blur the resolution of the seismic section. Most blurring comes from the first oscillation after the initial bubble collapse.

***590** Acoustic pulse technology uses a "primary-to-bubble ratio" to measure susceptibility to oscillation. This ratio compares the shock wave intensity of the initial expansion-collapse to the intensity of the first oscillation. A high ratio means the secondary shock waves are less likely to blur the seismic section.

Young tries to raise the primary-to-bubble ratio above prior art air gun sources by reducing the amplitude of the first oscillation. Young seeks this result by spacing at least three air guns in a characteristic array. The array separates the guns from each other by a critical distance. The distance, D , is at least 1.2 times greater than R , but less than or equal to twice R . R is the maximum radius of the initial air bubble from each gun. [FN*] With this spacing, the bubbles from each gun intersect before any single bubble reaches its maximum radius. This intersection dampens the overall oscillation. Young's independent claims each include a spacing limitation within this range.

FN* Mathematically, D is defined by $1.2 R \leq D \leq 2.0 R$.

Independent claim 1 is illustrative:

A method of producing a seismic pulse in a body of

water, including the steps of:

- (a) disposing in the water a set of at least three air guns, each adapted to produce in the water a gas bubble having maximum radius substantially equal to the quantity R , where the guns are disposed at depths such that each produces, when fired, a bubble of maximum radius R , and the guns are disposed such that each gun is separated from each of the nearest guns thereto in the set by a critical distance, D , where D is substantially equal to $\sqrt{2R}$; and
- (b) firing the air guns substantially simultaneously to produce a seismic pulse in the water.

Young's dependent claims define the number of the guns or their placement relative to each other or to the ocean surface.

The examiner rejected each of the claims as obvious under 35 U.S.C. § 103 in light of five prior art references. The examiner relied primarily on U.S. Patent No. 2,619,186 to Carlisle (the "Carlisle patent" or "Carlisle") to reject Young's claims. Carlisle is the only reference cited by the examiner or Board which suggests the air gun spacing in Young's claims.

Young contested the Board's and the examiner's consideration of Carlisle. Young argued that Carlisle concerns reducing bubble oscillation for chemical explosives, not air guns. Young also argued that an article by Knudsen published six years after Carlisle in the journal *Geophysics* expressly discredits the teachings of Carlisle. W. Knudsen, *Elimination of Secondary Pressure Pulses in Offshore Exploration (A Model Study)*, 23 *Geophysics* No. 3 at 440 (July 1958) (Knudsen). Therefore, Young contended, a person of ordinary skill in the seismic exploration art would not have considered Carlisle when developing an improved seismic array.

The Board rejected Young's arguments. The Board held that the examiner appropriately applied Carlisle notwithstanding the teachings of Knudsen. On appeal, Young asserts as error only the propriety of applying Carlisle as a reference in light of Knudsen's allegedly contrary teachings.

DISCUSSION

This court must decide whether the Board properly affirmed the examiner's rejection over Carlisle. Young has not challenged the other references cited in the examiner's rejection. Further, Young has not argued the merits of any particular claim apart from the others. Therefore, all claims stand or fall together

with representative independent claim 1. See *In re Kaslow*, 707 F.2d 1366, 1376, 217 USPQ 1089, 1096 (Fed.Cir.1983).

The Carlisle patent--"Seismic Exploration Method"--issued on November 25, 1952. Carlisle concerns minimizing bubble oscillation for chemical explosives used in marine seismic exploration. Carlisle controls bubble oscillation by spacing seismic sources to achieve a reduction of the secondary pressure pulse. Carlisle specifically *591 teaches spacing the seismic sources close enough to allow the bubbles to intersect before reaching their maximum radius. Carlisle spaces the bubble centers closer than two maximum bubble radii, or less than "2.0 R" in Young's notation. Carlisle, col. 3, lines 57- 60. Carlisle explains:

[T]he secondary energy normally available from these sources is dissipated by their mutual intersection and tends to eliminate the secondary seismic impulses created when the walls of the bubbles collapse.

Id. at lines 60-64. Thus, Carlisle expressly teaches the spacing limitation in each of Young's claims.

Notwithstanding Carlisle's teachings, Young argues that the Knudsen article discredits Carlisle. Knudsen describes a series of tests which evaluated four proposed techniques for suppressing bubble oscillation. Carlisle was one of the four. Knudsen's article opined that Carlisle yields no appreciable improvement in bubble oscillation suppression. The effective teaching of the Knudsen/Carlisle combination, Young argues, suggests avoidance of the spacing suggested in Carlisle. Therefore, Young would have this court conclude that his use of Carlisle's spacing would not have been obvious.

[1][2] Young misunderstands the effect that Knudsen has on Carlisle. The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Even if tending to discredit Carlisle, Knudsen cannot remove Carlisle from the prior art. Patents are part of the literature of the art and are relevant for all they contain. *In re Lemelson*, 397 F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968). For example, in *In re Etter*, 756 F.2d 852, 859, 225 USPQ 1, 6 (Fed.Cir.), *cert. denied*, 474 U.S. 828, 106 S.Ct. 88, 88 L.Ed.2d 72 (1985), a reference which disclosed obsolete technology remained in the prior art. This court considered the reference for what it disclosed in relation to the claimed invention.

[3][4] When prior art contains apparently conflicting references, the Board must weigh each reference for its power to suggest solutions to an artisan of ordinary skill. The Board must consider all disclosures of the prior art, *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976), to the extent that the references are, as here, in analogous fields of endeavor and thus would have been considered by a person of ordinary skill in the field of the invention. The Board, in weighing the suggestive power of each reference, must consider the degree to which one reference might accurately discredit another.

[5] As prior art, the Board correctly weighed Carlisle to determine the patentability of Young's claims. Carlisle expressly teaches both the method and the advantages of Young's claimed spacing. In fact, Carlisle expressly teaches the exact spacing set out as a limitation in Young's claims. Thus, the Board correctly attributed significant weight to Carlisle in its obviousness determination.

In determining what weight to accord to Carlisle as prior art, the Board also appropriately considered Knudsen's discrediting effect. The Board determined that Knudsen did not convincingly discredit Carlisle. Therefore, the Board appropriately concluded that Knudsen would not have led one skilled in the art to reject Carlisle.

Knudsen did not test Carlisle according to its teachings. For instance, Knudsen did not use an explosive charge in modeling Carlisle. Rather, Knudsen tried to simulate Carlisle with a capacitive electrical discharge in a barrel of oil.

Knudsen did not replicate Carlisle's teachings on spacing. Knudsen tried to model Carlisle by separating the seismic sources by one, two and three bubble radii. Knudsen at 42. At the maximum spacing of three bubble radii, the bubbles will not intersect at all. Carlisle specifically requires spacing to permit bubble intersection. Carlisle, col. 4, lines 47-52. At a spacing of one bubble radius, the two bubbles coalesced into one before the initial collapse. Knudsen at 45. If just one bubble is present, the bubble will oscillate as if *592 no second seismic source was present. Carlisle specifically requires spacing to prevent the formation of one bubble. Carlisle, col. 4, lines 34-37. Finally, at the two bubble radii spacing in Knudsen, the bubbles will just barely intersect. Carlisle requires that the bubbles intersect before each bubble achieves its maximum radius.

Carlisle, col. 3, lines 58-60. In sum, Knudsen did not duplicate or appropriately model Carlisle's spacing.

Knudsen's conclusion that Carlisle would "not be effective in eliminating the secondary pressure pulse" also directly contradicts data contained in Knudsen. The Knudsen data point for the two-radii horizontal bubble spacing, although not a completely accurate model of Carlisle, shows a 30% reduction of the secondary pressure pulse. Knudsen at 45, Table 4. This data point represents the only point where Knudsen approximates the spacing shown in Carlisle. At that point, Knudsen confirmed Carlisle's teachings.

The Board found that Knudsen "did not test the Carlisle technique under conditions which are directly comparable to the Carlisle disclosure." Weighing the discrepancies between the Knudsen model and Carlisle's teachings, as well as Knudsen's tendency to confirm Carlisle where the model approximated Carlisle, the Board concluded: "we do not agree that Knudsen discredits Carlisle."

Because Knudsen did not accurately test Carlisle, an artisan of ordinary skill would not have dismissed Carlisle in light of Knudsen as a whole. It is far more likely that the skilled artisan would have afforded little weight to Knudsen itself. The Board did not err in relying on Carlisle and discounting Knudsen.

CONCLUSION

Knudsen is not so credible or persuasive of a contrary teaching that it would have deterred the skilled artisan from using the teachings of Carlisle. The examiner's use of Carlisle in his rejection of Young's claims is not clearly erroneous. The Board's decision affirming the examiner's rejection is therefore

AFFIRMED.

927 F.2d 588, 18 U.S.P.Q.2d 1089

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Appendix 7:

In re Zurko, 258 F.3d 1379, 59 U.S.P.Q.2d 1693 (Fed. Cir. 2001).

H

United States Court of Appeals,
Federal Circuit.

In re Mary E. ZURKO, Thomas A. Casey, Jr., Morrie
Gasser, Judith S. Hall,
Clifford E. Kahn, Andrew H. Mason, Paul D. Sawyer,
Leslie R. Kendall, and
Steven B. Lipner.

Nos. 96-1258, 07/479,666.

Aug. 2, 2001.

Patent applicant appealed decision of Board of Patent Appeals and Interferences rejecting application for patent relating to method for improving security in computer systems. The Court of Appeals for the Federal Circuit, 111 F.3d 887, reversed on original submission, and again reversed on rehearing en banc, 142 F.3d 1447. Certiorari was granted and the Supreme Court reversed and remanded, 527 U.S. 150, 119 S.Ct. 1816, 144 L.Ed.2d 143. On remand, the Court of Appeals, Archer, Senior Circuit Judge, held that: (1) Board's reliance on alternative references was not warranted, and (2) Board's reliance merely on basic knowledge or common sense when evaluating patentability, not being based on any evidence in the record, was unwarranted.

Reversed.

West Headnotes

[1] Patents ☞ 16(2)
291k16(2)

[1] Patents ☞ 16(3)
291k16(3)

[1] Patents ☞ 16.13
291k16.13

[1] Patents ☞ 36.1(1)
291k36.1(1)

Obviousness is a legal question based on underlying factual determinations including: (1) the scope and content of the prior art, including what that prior art teaches explicitly and inherently; (2) the level of ordinary skill in the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. 35

U.S.C.A. § 103(a).

[2] Patents ☞ 113(6)
291k113(6)

The Court of Appeals reviews the ultimate legal determination of obviousness of a claimed invention without deference. 35 U.S.C.A. § 103(a).

[3] Patents ☞ 113(6)
291k113(6)

The Court of Appeals reviews factual findings underlying the determination of obviousness of a claimed invention for substantial evidence. 35 U.S.C.A. § 103(a).

[4] Administrative Law and Procedure ☞ 791
15Ak791

"Substantial evidence" is such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.

[5] Administrative Law and Procedure ☞ 791
15Ak791

A review under the substantial evidence standard involves an examination of the record as a whole, taking into consideration evidence that both justifies and detracts from the agency's decision; the possibility of drawing two inconsistent conclusions from the evidence does not prevent an administrative agency's finding from being supported by substantial evidence.

[6] Administrative Law and Procedure ☞ 791
15Ak791

The substantial evidence standard of review of an agency's decision is analogous to the review of jury findings, and it is more deferential than the clearly erroneous standard of review.

[7] Patents ☞ 16.14
291k16.14

Board of Patent Appeals reliance on alternative references, to conclude that patent application for method of improving security in computer systems was obvious, was not warranted; alternative references did not support Board's conclusion and reliance on new combination of references, not previously considered,

would have constituted impermissible new ground for rejection. 35 U.S.C.A. § 103(a).

[8] Patents ☞ 111
291k111

The Board of Patent Appeals cannot simply reach conclusions based on its own understanding or experience, or on its assessment of what would be basic knowledge or common sense, rather, the Board must point to some concrete evidence in the record in support of these findings. 35 U.S.C.A. § 103(a).

[9] Patents ☞ 111
291k111

Reliance by Board of Patent Appeals on its assessment of what was basic knowledge, that communication in trusted environments was performed over trusted paths, and that verifying a trusted command in UNIX over a trusted path was nothing more than good common sense, not being based on any evidence in the record, was unwarranted, for purpose of patent application relating to method for improving security in computer systems; although Board could rely on its expertise as to peripheral issues, patentability could not be determined by such reliance. 35 U.S.C.A. § 103(a).

Patents ☞ 328(2)
291k328(2)

4,918,653. Cited.

***1380** Linda Moncys Isacson, Associate Solicitor, Office of the Solicitor, U.S. Patent and Trademark Office, of Arlington, VA, argued for the Commissioner of Patents and Trademarks. With her on the brief were John M. Whealan, Solicitor, Kenneth R. Corsello and Thomas J. Finn, Associate Solicitors.

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Charles F. Schill, Foley & Lardner, of Washington, DC, for amicus curiae Federal Circuit Bar Association. With him on the brief were James A. Sprowl and Amy L. Wilsey. Of counsel on the brief were Michael E. Dergosits, President, George E. Hutchinson, Executive Director, and Rudolph P. Hofmann, Jr., Chair, Amicus Committee, Federal Circuit Bar Association, of Washington, DC.

Before PAULINE NEWMAN, Circuit Judge, ARCHER, Senior Circuit Judge, and MICHEL, Circuit Judge.

ARCHER, Senior Circuit Judge.

This case is before us on remand from the Supreme Court of the United States. *Dickinson v. Zurko*, 527 U.S. 150, 119 S.Ct. 1816, 144 L.Ed.2d 143, 50 USPQ2d 1930 (1999) ("*Zurko III*"). In *Zurko III*, the Court reversed our judgment and remanded the case because we had reviewed the factual findings of the Board of Patent Appeals and Interferences ("Board") for clear error, an incorrect standard of review.

The Board decision at issue, *Ex parte Zurko*, No. 94-3967 (Bd. Pat. Apps. & Int. Aug. 4, 1995), sustained the rejection of U.S. Patent Application No. 07/479,666 ("the '666 application") under 35 U.S.C. § 103 (1994). In our initial review of this decision, we determined that the Board's findings were clearly erroneous and we reversed. *In re Zurko*, 111 F.3d 887, 42 USPQ2d 1476 (Fed.Cir.1997) ("*Zurko I*"). At the Commissioner's suggestion, we then reheard this case en banc to reconsider the question of the appropriate standard of review. The Commissioner argued that Board findings should be reviewed under the standards of the Administrative Procedure Act (APA), namely the substantial evidence or arbitrary and capricious standard. 5 U.S.C. § 706 (1994). The en banc court held, however, that clear error was the correct standard of review for Board findings of fact and adopted the conclusions of the original panel decision. *In re Zurko*, 142 F.3d 1447, 46 USPQ2d 1691 (Fed.Cir.1998) ("*Zurko II*").

The Commissioner then petitioned for review by the Supreme Court, and the Court reversed, holding that Board findings of fact must be reviewed under the

APA standards of review. The Court did not specify which APA standard of review to apply, substantial evidence or arbitrary and capricious. We subsequently decided this question in *In re Gartside*, 203 F.3d 1305, 53 USPQ2d 1769 (Fed.Cir.2000), and held that substantial evidence is the correct APA standard of review for Board factual findings.

We now revisit the merits of our decision in *Zurko I*, applying the proper APA standard of review. In doing so, we conclude that the outcome of this case does not change with the application of this new standard of review. Because the factual findings underlying the Board's decision are not supported by substantial evidence, we reverse.

*1382 BACKGROUND

The '666 application concerns a method for more efficiently creating a secure computer environment. Secure, or "trusted," computer environments employ trusted software designed to preclude unauthorized users and to prevent unintended or unauthorized commands. Such trusted software is often quite costly, compared to untrusted software, so it is desirable to minimize the amount of trusted software in the system. Applicants claim a method for processing trusted commands with a minimum of trusted software.

Representative claim one reads as follows:

1. A machine-executed method for executing a trusted command issued by a user on a computer system, the computer system including an untrusted computing environment and a trusted computing environment, said method comprising the steps of:
 - (a) parsing the trusted command in the untrusted computing environment to generate a parsed command;
 - (b) submitting the parsed command to the trusted computing environment;
 - (c) displaying a representation of the trusted command to the user through a trusted path;
 - (d) receiving a signal from the user through a trusted path signifying whether the displayed representation accurately represents the user's intentions;
 - (e) if the signal signifies that the displayed representation does not accurately represent the user's intentions, then preventing the execution of the parsed command;
 - (f) if the signal signifies that the displayed representation accurately represents the users intentions, executing the parsed command in the trusted environment.

As set forth in claim one, applicants' method involves processing and verifying a trusted command using both trusted and untrusted software. A trusted command is first processed by untrusted software to create a parsed command. The parsed command is then submitted to the trusted computer environment. Execution of this command requires verification along a trusted path. The parsed command is relayed to the user along a trusted path, and, if correct, the user can send a confirming signal back along this trusted path, allowing execution of the command. By processing a trusted command in this manner, the applicants contend they reduce the amount of trusted software. The applicants assert that the parsing step generally requires a large amount of software and that performing this step with untrusted software greatly reduces the amount of trusted code required to process a trusted command.

The Board sustained the Examiner's rejection of claims 1, 4, and 5 of the '666 application under 35 U.S.C. § 103 based on two prior art references. The primary reference is the UNIX operating system, as described in the applicants' information disclosure statement ("IDS"). According to this description, the UNIX system employs both untrusted and trusted code. Furthermore, certain commands in a UNIX system may be parsed in an untrusted environment, and then these parsed commands may be executed by "calling a trusted service that executes in a trusted computing environment."

The secondary reference, also described in applicants' IDS, is Dunford, FILER Version 2.20 ("FILER2"). This program *1383 repeats back potentially dangerous commands, requesting confirmation from the user before execution.

Considering the teachings of these two references, the Board concluded that the invention claimed by the '666 application would have been obvious. The Board commented that "the artisan would have been led from these teachings to take the trusted command parsed in an untrusted environment and submitted to the trusted computing environment, as taught by UNIX, and to display the parsed command to the user for confirmation prior to execution, as suggested by [FILER2]." *Ex parte Zurko*, slip op. at 6-7. According to the Board, this combination would render the claimed invention obvious.

The Board also responded to applicants' arguments that neither reference discloses a trusted path communication to the user and that no teaching of the

prior art references motivates the combination of these references to create the claimed invention. The Board said that communication along a trusted path, if not explicit in the prior art, is either inherent or implicit. *Id.* at 7. The Board further adopted the Examiner's assertion that "it is basic knowledge that communication in trusted environments is performed over trusted paths." *Id.* at 8. As for the motivation to combine these references, the Board concluded that it "would have been nothing more than good common sense" to combine the teachings of these references. *Id.* The Board noted that FILER2 taught the verification of dangerous commands in general, suggesting verification of the parsed command submitted to the trusted computing environment in UNIX. Because this verification occurs within a trusted environment, it is "basic knowledge," according to the Board, that this verification would occur along a trusted path. *Id.* at 7-8.

Reviewing the Board's decision in *Zurko I*, we held that "the Board's finding that the prior art teaches, either explicitly or inherently, the step of obtaining confirmation over a trusted pathway [was] clearly erroneous." *Zurko I*, 111 F.3d at 889, 42 USPQ2d at 1478. Indeed, we noted that neither reference relied upon by the Board taught communication with the user over a trusted pathway. *Id.*, 42 USPQ2d at 1479. We further held that the Board clearly erred in finding that the prior art teaches communicating with the user over both a trusted and an untrusted path. This finding was in conflict with the Board's other finding that trusted communications must be over trusted paths. *Id.* at 890, 42 USPQ2d at 1479.

On remand, applicants urge that we maintain our reversal of the Board's decision, arguing that the decision is legally flawed, or, alternatively, that the Board's factual findings fail under the APA standard of review. The Commissioner respond that we must affirm the Board decision because its findings are supported by substantial evidence in the record.

DISCUSSION

[1][2][3] A claimed invention is unpatentable for obviousness if the differences between it and the prior art "are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a) (1994); *Graham v. John Deere Co.*, 383 U.S. 1, 14, 86 S.Ct. 684, 15 L.Ed.2d 545, 148 USPQ 459, 465 (1966). Obviousness is a legal question based on underlying factual determinations including: (1) the

scope and content of the prior art, including what that prior art teaches explicitly and inherently; (2) the level of ordinary skill in the prior *1384 art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *Graham*, 383 U.S. at 17-18, 86 S.Ct. 684, 15 L.Ed.2d 545, 148 USPQ at 467; *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed.Cir.1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed.Cir.1995) (stating that the inherent teachings of a prior art reference is a question of fact). We review the ultimate legal determination of obviousness without deference. *In re Dembiczak*, 175 F.3d at 998, 50 USPQ at 1616. We review factual findings underlying this determination for substantial evidence. *In re Gartside*, 203 F.3d at 1311-16, 53 USPQ2d at 1772-75.

[4][5] Substantial evidence is "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229, 59 S.Ct. 206, 83 L.Ed. 126 (1938); see also *Zurko III*, 527 U.S. at 162, 119 S.Ct. 1816, 50 USPQ2d at 1772-75. A review under this standard "involves an examination of the record as a whole, taking into consideration evidence that both justifies and detracts from the agency's decision." *In re Gartside*, 203 F.3d at 1312, 53 USPQ2d at 1773 (citing *Universal Camera Corp. v. NLRB*, 340 U.S. 474, 487-88, 71 S.Ct. 456, 95 L.Ed. 456 (1951)). In addition, "the possibility of drawing two inconsistent conclusions from the evidence does not prevent an administrative agency's finding from being supported by substantial evidence." *Consolo v. Fed. Maritime Comm'n*, 383 U.S. 607, 619-20, 86 S.Ct. 1018, 16 L.Ed.2d 131 (1966).

[6] The substantial evidence standard has been analogized to the review of jury findings, and it is generally considered to be more deferential than the clearly erroneous standard of review. *Zurko III*, 527 U.S. at 162-63, 119 S.Ct. 1816, 144 L.Ed.2d 143, 50 USPQ2d at 1936. The Supreme Court noted in *Zurko III*, however, that this generally recognized difference is "a subtle one," so fine that in its review of case law in the *Zurko III* decision, the Court could not find any other case where a reviewing court had conceded that the standard of review made a difference. *Id.* Moreover, while appellate courts must respect agency expertise, the Court has "stressed the importance of not simply rubber-stamping agency fact finding." *Id.* (citing *Universal Camera*, 340 U.S. at 477-78, 71 S.Ct. 456). Indeed, the Court observed that Federal Circuit judges "will examine [Board fact] findings through the

lens of patent-related experience--and properly so, for the Federal Circuit is a specialized Court." *Id.* The Court further noted that this "comparative expertise, by enabling the Circuit better to understand the basis for the [Board's] finding of fact, may play a more important role in assuring proper review than would a theoretically somewhat stricter standard." *Id.*

With this guidance from the Supreme Court in mind, we now reconsider the Board's decision. Applicants urge that we reaffirm our conclusion in *Zurko I*, alleging numerous legal and factual errors in the Board decision. These arguments center around two issues. First, applicants argue that the prior art relied upon by the Board does not disclose one of the limitations of their claimed invention, namely communication between a trusted environment and the user along a trusted path. Second, applicants claim that there is no substantial evidence support for the Board's finding of motivation to combine the cited references to yield the claimed invention. We only need to consider the first issue raised by applicants.

***1385** [7] As to this first issue, the Commissioner apparently concedes that neither the UNIX IDS disclosure nor FILER2 teaches communications between the user and the trusted environment along a trusted path. Nevertheless, the Commissioner maintains that the Board's findings concerning the content of the prior art are supported by four other references in the record. [FN1] The Commissioner argues that these additional references describe modified UNIX systems that allow communication over both trusted and untrusted paths. Therefore, the Commissioner argues, the Board's general findings concerning the content of the prior art have substantial evidence support, as does its ultimate conclusion of obviousness.

FN1. Specifically, the Commissioner points to Johrie et al., U.S. Pat. No. 4,918,653; E.J. McCauley et al., *KSOS: The Design of a Secure Operating System*, Ford Aerospace and Communications Corp. (1979); Stanley R. Ames, Jr. et al., *Security Kernel Design and Implementation: An Introduction*, IEEE Cat. No. 830700-001 (July 1983); and Simon Wiseman et al., *The Trusted Path Between Smite and the User*, Proceedings 1988 IEEE Symposium on Security and Privacy (April 18-21, 1988).

We are unpersuaded by the Commissioner's arguments. The Board's conclusion of obviousness was based on the UNIX and FILER2 references. The Board's findings with respect to these references simply cannot be supported by the alternative

references identified by the Commissioner on remand. To the contrary, these alternative references merely confirm the well-known fact that conventional UNIX systems do not allow communication between the user and the trusted environment along a trusted path. For example, Johrie et al., U.S. Pat. No. 4,918,653, comments that "[s]ome examples of prior art multi-user operating systems which have not provided an effective mechanism for establishing a trusted path include UNIX...." Johrie, col. 1, ll. 60-63.

The Commissioner also cannot now mend the Board's faulty conclusion of obviousness by substituting these alternative references for those relied upon by the Board. This new combination of references would constitute a new ground for rejection, not considered or relied upon by the Examiner or the Board. It is well settled that it would be inappropriate for us to consider such a new ground of rejection. *In re Margolis*, 785 F.2d 1029, 1032, 228 USPQ 940, 942 (Fed.Cir.1986); see also *Koyo Seiko Co., Ltd. v. United States*, 95 F.3d 1094, 1099 (Fed.Cir.1996) (holding that "[t]he grounds upon which an administrative order must be judged are those upon which the record discloses that its action was based.") (quoting *SEC v. Chenery Corp.*, 318 U.S. 80, 87, 63 S.Ct. 454, 87 L.Ed. 626 (1943)).

[8][9] Finally, the deficiencies of the cited references cannot be remedied by the Board's general conclusions about what is "basic knowledge" or "common sense" to one of ordinary skill in the art. As described above, the Board contended that even if the cited UNIX and FILER2 references did not disclose a trusted path, "it is basic knowledge that communication in trusted environments is performed over trusted paths" and, moreover, verifying the trusted command in UNIX over a trusted path is "nothing more than good common sense." *Ex parte Zurko*, slip op. at 8. We cannot accept these findings by the Board. This assessment of basic knowledge and common sense was not based on any evidence in the record and, therefore, lacks substantial evidence support. As an administrative tribunal, the Board clearly has expertise in the subject ***1386** matter over which it exercises jurisdiction. This expertise may provide sufficient support for conclusions as to peripheral issues. With respect to core factual findings in a determination of patentability, however, the Board cannot simply reach conclusions based on its own understanding or experience--or on its assessment of what would be basic knowledge or common sense. Rather, the Board must point to some concrete evidence in the record in support of these findings. [FN2] To hold otherwise would render the process of appellate review for

(Cite as: 258 F.3d 1379, *1386)

substantial evidence on the record a meaningless exercise. *Baltimore & Ohio R.R. Co. v. Aderdeen & Rockfish R.R. Co.*, 393 U.S. 87, 91-92, 89 S.Ct. 280, 21 L.Ed.2d 219 (1968) (rejecting a determination of the Interstate Commerce Commission with no support in the record, noting that if the Court were to conclude otherwise "[t]he requirement for administrative decisions based on substantial evidence and reasoned findings-- which alone make effective judicial review possible--would become lost in the haze of so-called expertise"). Accordingly, we cannot accept the Board's unsupported assessment of the prior art.

FN2. As described above, we cannot accept the Commissioner's invitation to now search the record for references in support of the Board's general conclusions concerning the prior art. Even if any such

references could support these conclusions, it would be inappropriate for us to consider references not relied upon by the Board. *In re Margolis*, 785 F.2d at 1032, 228 USPQ at 942.

CONCLUSION

The Board's conclusion of obviousness was based on a misreading of the references relied upon and, therefore, lacks substantial evidence support. Accordingly, the Board's judgment is reversed.

REVERSED.

258 F.3d 1379, 59 U.S.P.Q.2d 1693

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